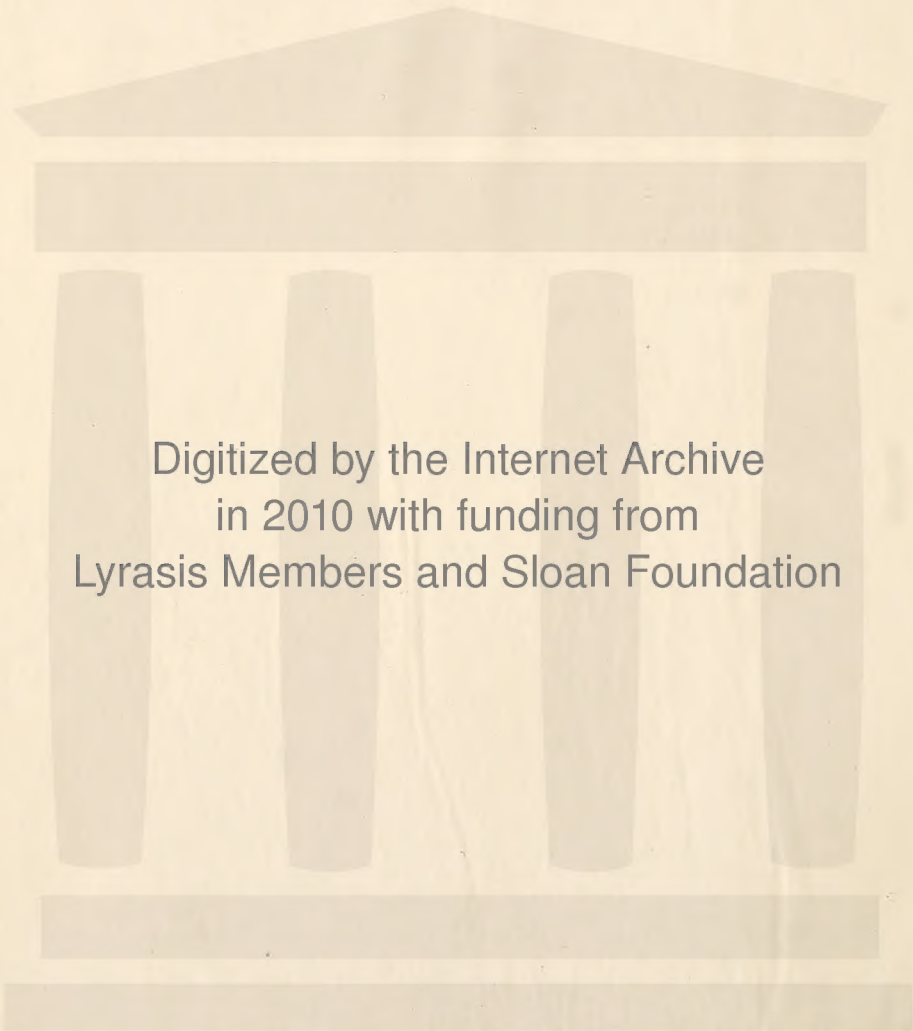
AMERICAN FOUNDATION
FOR THE BLIND INC.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SURVEY OF AMERICAN INDUSTRIES

to find

EMPLOYMENT OPPORTUNITIES FOR THE BLIND

A.B. Segur

Red Cross Institute for the Blind

1918-1919

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AMERICAN FOUNDATION FOR THE BLIND RESEARCH DEPT.

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Report

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Chicago, Illinois, July 16, 1919

Committee on Direction,
Red Cross Institute for the Blind
Baltimore, Maryland

Gentlemen:

I have the honor to submit a report on the industrial survey work done for the Red Cross Institute for the Blind to date.

On June 26, 1918 the undersigned held a conference with Lieutenant Colonel James Bordley, then Director of the Red Cross Institute for the Blind, at which the following conditions were pointed out:

The Germans had been driving down toward Paris at a terrific rate; the Marne drive had just been halted at Chateau Thierry, and the first reports of the blind were coming through. The drive on the Western flank of the German army was imminent, and a vast number of blind were expected from this source. The number of blind in the forces of the allies in proportion to the number of men in action had been rather large, and it was expected that the same ratio would hold in the new drives that were to come. A long war was expected, and the work had to be so arranged that the blind would be taken care of as the war progressed.

The only place that any really satisfactory work had been done for the blind soldiers was at St. Dunstans, London, by Sir Arthur Pearson. Here, occupations had been taught, fitting into English conditions, but having practically no bearing on conditions that confronted American industries. The problem of placing the blind under peace time conditions had not yet been worked out, either in England or in the United States, and much of the placement in England had been on the basis of sentiment. The total percent of placements following training had not yet been determined because of the unsettled conditions of affairs in Europe.

St. Dunstans, however, had taught the world the lesson of normality for the blind in daily life and in earning capacity. It was very largely in emulation of what had been done at St. Dunstans, that the American Army took hold of the work for the blind in this country.

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St. Dunstans, however, had taught the world the lesson of normality for the blind in daily life and in earning capacity. It was very largely in emulation of what had been done at St. Dunstans, that the American Red Cross [illegible] blind in this country.

In this country, the status of blind work was considerably worse than in England. Outside of a few people who had been placed by some of the more advanced workers among the blind, comparatively few men had ever been placed in industry where they were successfully competing with sighted labor on an even basis. It was generally considered that the blind man was a hopeless individual, foredoomed to beg forever, or to be dependent, at least in a great measure, on someone else. This feeling was not entirely universal, still it prevailed through a large portion of the population.

One evidence of this feeling was the attitude of the blind. They had been in the habit of thinking of blindness as such a handicap that, once a man was blinded, he was forced, as a matter of course, to depend upon someone else, and the sooner he made up his mind to conform to this condition, the better off he would be. In fact, in a great many cases, people who said that the blind could work, were simply laughed at by the blind. In many cases, the directors of the blind seem to have shared the same feeling. The subject of pensions for the blind was discussed very largely from the standpoint as to how large the pensions should be. As a general thing, the discussions in workers' conferences on the employment for the blind ran to the subject of broom making, chair caning, and piano tuning. There were a few of the workers who had the idea that the blind could work in factories, but they were in the minority. There was very little differentiation made in the placement problem between the capable blind man and the incapable blind man, all men being placed on the same footing very largely because they were blind.

Employers seemed to have very much the same idea, and the general custom seemed to be that when a man became blind in any man's employ, he was an outcast for the rest of his life as far as getting a job was concerned. True, there were several more far-sighted employers in the country, notably the Crocker Wheeler Company, of Ampere, New Jersey, who had placed the blind at winding armatures; but even here, the general thought was that the blind were in a class by themselves and could not be expected to compete with sighted help. The efficiency of the blind was generally placed by the blind workers and employers at from thirty to fifty per cent. Under these conditions, the blind did not especially appeal to the employers from the standpoint of economical labor supply.

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The work among the work shops and schools was not in much better condition. The shop which made money or which came out even was so highly advertised that it only served to call attention to the fact that the average shop where blind people were employed was a money losing proposition. The conception that the blind should be carefully trained to get maximum production had apparently not penetrated to the shop managers where blind were employed, largely because the feeling that existed among these men, as with all other workers for the blind, was that a blind man was practically hopeless anyhow, and that if they got any work out of him at all, it was so much gained.

It is not so very strange that under such circumstances the blind over the entire country were considered objects for charity, and that the blind man with the tin cup was an object which always brought money from the passing public. Needless to say, if money came in that easy, once a blind man had been broken in to the point of view of taking alms from other people and living without work, he was not very likely to hunt very hard for a job, especially where everyone tried to convince him that a blind man could not work successfully. This conception led to a vast amount of pauperism among the civilian blind, and one of the main things with which the blind soldier was faced on coming back to America, was the well meant charity of a large number of people which would be a positive detriment to the soldier himself. In fact, one of the things that the average blind soldier dreaded more than anything else was the thought that we would be regarded as a subject for pity for the rest of his life instead of being regarded as a companion by the rest of the people.

Fortunately, a desire to cooperate in the rehabilitation movement prevailed among the employers. The work done by Sir Arthur Pearson in England, and the publications by the Red Cross had made a vast number of converts to the doctrine of normality among manufacturers. The feeling had not yet penetrated to the average employer that the handicapped would make valuable employees, but rather, the spirit prevailed that, if the soldier was willing to go over and give up his eyes, which the employer considered everything, the employer could at least give up some of his attention, and perhaps give up some of the output on his various machines to find him a job for the rest of his life.

On the inside of the Army and other institutions, however, this spirit of cooperation did not seem to hold quite to this extent. Due to a lack of centralization of authority and a lack of understanding as to the problems involved, there was a constant running fight going on between the different agencies handling these problems. The question was whether the Red Cross, the Federal Board of Vocational Education, or the United States Army was to handle the problems.

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Furthermore, there seemed to be more or less resentment among some blind workers against the program as suggested by the Red Cross. The doctrine of specialization had not yet made headway in this field.

In the beginning, the Red Cross Institute for the Blind was as much at sea as to a definite policy on details as was anybody else connected with the blind problem. There was very little definite policy as to the detail work of the whole school; but Colonel Bordley had one policy which became the general policy of Evergreen, namely, that the Red Cross Institute for the Blind was going to train the blind soldier until he could compete with anyone on any occupation which was adaptable to him. The only instructions given for making the surveys were

1. that a survey should be made of all the industries of the country to determine, once for all, what occupations were adaptable to the blind, and

2. that courses of study should be laid out which would enable the blind man to fit into the position for which he was adapted.

The general idea was that there were only a small number of openings for the blind at the best, and that it would take some time before any real results could be accomplished.

The Army Medical Staff was in control of the school at Evergreen, and had charge of all teachers and the work of all the pupils. The American Red Cross had control of the Red Cross Institute for the Blind, supplemented the Army appropriation for hospital purposes, found openings for the blind, and made it possible for the blind to enter industry. Under the law creating the Federal Board of Vocational Education, the Federal Board had control of all handicapped soldiers, including the blind, and it became the duty of the Board, not only to take care of the education of the soldiers, but to place them in industry as well. The Federal Board, on the other hand, had not taken the attitude of surveying the industries to find openings, and consequently, the only agency which would have the data which made it possible to place the blind man intelligently was the American Red Cross.

Very little opportunity was given to the manufacturer and to the employer to be heard in any of the discussions on the handicapped. The employer was asked to cooperate, but was not given any means by which he could cooperate. The plants were not thoroughly studied, and consequently, there was very little coordination between the handicapped and industry.

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During the early days of the study, I think that all of us who were connected with this work can truthfully say that the inspiration of the whole Institute was Colonel Bordley and his devotion to this cause. When it seemed as though everything was going to go against the Red Cross Institute for the Blind, and that all the work that had been done was to be wrecked over night, Colonel Bordley was generally on the job, and came back with flying colors.

The divisions of authority and lack of coordination has made the work of conducting industrial surveys difficult from the beginning, inasmuch as it was impossible at any point to use the follow-up, which was absolutely necessary to get the maximum results out of the survey. It has been an easy matter to find the openings and make the job available for the handicapped man, but it has not been possible to find the man to fit into the position after the employer was once sold on the idea of using a handicapped man, and to lay out the training as to the various positions as the work went along.

It has been difficult from the beginning to determine who was who in all of this work, whether to appeal to the Federal Board of Vocational Education, or whether to appeal to the United States Army. Now doubt the very best plan from the beginning would have been for each to have gotten together and determined what each was to handle and worked out a cooperative plan. But this was not done for some months after the passage of the various acts. It is safe to say that, with the labor shortage which existed during the war, had the various agencies been able to get together on a sound program, practically every worthy handicapped man in the United States would have been placed long before the war closed, and even today, if the agencies were all working in perfect team work, the capable man who was out of a job because of being handicapped would be the exception rather than the rule.

Inside the school, more or less disagreement existed between different people regarding policies to be followed. Those who believed in hand training were pitted against those who believed wholly in industrial training. Undoubtedly there was room for both. How much better it would have been if both of these interests had been brought together, and something like a schedule worked out for the blinded soldiers. Needless to say, under the circumstances, it has been impossible to keep some of these disagreements from coming to the soldiers themselves, and a great deal of difficulty in getting the soldiers down to work in the school has been due, very largely, to the disagreements on the part of the people who were charged with the duty of taking care of these men.

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In the plants, the work has, in many cases, been made exceedingly difficult. The question of authority for doing the work has been one which has come up constantly. The employers, of course, desired to deal with the agencies who had the authority to place the handicapped, and desired to deal with but one party in the entire matter. It has only been by dint of salesmanship on the part of the field men who have been on the inside of the plants ~~plants~~ themselves, that the Red Cross has been able to get much of any information at all. Most of the employers, however, have been satisfied with the results that they have obtained. Once the work was started, we have received the highest of cooperation from the plants themselves. This has been especially true in a few of the plants which have been very progressive in their policies of management, and will be mentioned a little later. Notwithstanding the difficulties, the surveys were undertaken, with the understanding that the engineer was to be permitted to carry out the work either in Chicago, Baltimore, or any other city where the best results could be obtained.

About the first thing discovered on beginning the work was that the literature on the subject of industrial surveys for the blind was extremely meagre. Previous to the war, there had been practically nothing done. In this country, Mr. F.B. Gilbreth, Consulting Engineer, of Providence, Rhode Island, had stated in public speeches that it was possible for the blind man to earn the same wage as the sighted if he were properly trained, and that with the proper method used in industrial analysis, it would be unnecessary for many workmen to use their eyes. In Canada, a very good Department for general analysis had been worked up, but the surveys were made mostly of very small plants, and the statements of openings was of the most general sort, very little data being given which was specific enough to give the placement people much of any real information. Furthermore, the cost of maintaining the Canadian service was very great, and the funds of the Red Cross would hardly permit of this expenditure. The Department of Vocational Guidance of Harvard University had been making a number of studies of different trades over the country for the purpose of teaching vocational guidance and employment management at Harvard University. At the request of Mr. Douglas C. McMurtrie of the Red Cross Institute for Crippled and disabled Men at New York, they had made one or two surveys to determine the possibilities of the handicapped. But again, these surveys were of rather a general nature, and did not bring the operations down to specific terms in such a way that it was possible to say whether the blind man could perform the operations or not.

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Of course, it is very evident that if a person is simply to look at a job and form a rough estimate as to its possibilities, there are very few jobs which would be specified as jobs which could be performed by the blind. Unless the job is very carefully analyzed, its possibilities for the blind can never be discovered. Practically none of the data had been collected along these lines. The purpose in handling surveys has not been to enable the men to obtain maximum production, but rather to find a job that they could fill in some sort of fashion, the idea being that the Government would make up in pension what the men lacked in income.

With the beginning of the war, questionnaires were sent everywhere by different agencies, asking for all sorts of information and receiving consequently, all sorts of answers. The general feeling persisted among the manufacturers that the questionnaire had been greatly overdone, and consequently, the answers given the questionnaires were very perfunctory. The State of Pennsylvania made a questionnaire survey for the handicapped of Penn. of what purported to be all of the industries of Penn, and found openings for some few thousands of handicapped men. The number of positions which were specified as being open to the blind were less than one hundred. As a matter of fact, there are considerably more than one million positions in the State of Pennsylvania which could be handled by handicapped men, and the number in the State of Penn. which could be handled by the blind numbers well into the hundred of thousands. This was the general result of the questionnaire method, and consequently, there was but very little in these questionnaires which was of value.

It was necessary, therefore, for the Red Cross to work out its own program, and to develop a method of making surveys which would uncover practically all positions which were open to the blind in any plant, and which, at the same time, could be handled by men picked up and given a short course of training in doing this work.

Since that time, the policy has been to make a thorough job analysis in every industry that was studied, and to open to the blind man every occupation which could be made available. This meant a careful study of the occupations from practically every angle, and a rearrangement, in some cases, of the usual practice in the field in order to make this possible. But all of this work has been done in accordance with the general purpose of the Red Cross Institute in carrying out this work.

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In making the first surveys the Red Cross undoubtedly made a number of mistakes; but it must be remembered that the survey methods of the Red Cross Institute for the Blind have been largely a matter of development, and as a new idea has presented itself which seemed better than the old one, it has been adopted and the old idea dropped. At the same time, the data which had been collected under the old method has been preserved and is being utilized.

The next item which was realized, was, that in order to make a study of all the industries of the U.S. to determine what the blind could do, it was necessary to have a list of all the industries of the country classified along the lines of occupation; that plants which had similar occupations should be placed in a group by themselves; and that these groups should be placed in larger groups representing some other major division of the industry.

A study was made of different classifications that existed to determine where this list could be obtained. The first study made was of the Bureau of Census Reports of the Department of Commerce. This classification was found to have been made without any reference to occupation whatever, and many of the industries which were widely separated in their methods of manufacture were grouped as one. For instance, lumber and furniture manufacture were grouped together. The Department of Internal Revenue had worked out a classification based on the name of the industries as set forth by the people who made their income tax returns. This was a smaller classification than that made by the Department of Commerce, but still made without very much reference to the question of occupation. The National Chamber of Commerce had a division which was very good as far as it went, but it only contained a list of the members in the various divisions of the National Chamber of Commerce, and as a great number of industries which had associations were not members of the National Chamber of Commerce, this again, was very incomplete.

None of these classifications contained the information so classified as to be of great use to the Red Cross in handling its survey. Nor did a combination of the various classifications aid a great deal, because in many cases, the omission of various industries was practically the same in all of the classifications made. For instance, specialties included a vast number of industries, all of which varied very greatly in the nature of their occupations. It therefore became necessary for the Red Cross to work up, in cooperation with other agencies, their own classification of American industries. The Red Cross, has, consequently,

In making the first surveys the Red Cross undoubtedly made a number of mistakes; but it must be remembered that the survey methods of the Red Cross Institute for the Blind have been largely a matter of development, and as a new idea has presented itself which seemed better than the old one, it has been adopted and the old idea dropped. At the same time, the data which had been collected under the old [illegible] preserved and is being utilized.

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made up, at a great deal of labor and expense, a partial classification of American industries on the basis of occupations. See Appendix A. It is now possible, by means of this classification, to so divide the work in different industries that a survey of one plant often serves the same purpose as one made of hundreds of plants very widely scattered. This, of course, is an improvement over the first method suggested, of surveying the different industries by town and cities, and enabled the central organization to get the data as to what happened in the extreme West of the country by surveying a similar plant in the extreme Eastern part, and being reasonably sure that the conditions are almost identically in the two plants, at least sufficiently so that the plant on the Western coast is willing to accept the result of the survey made on the Eastern coast.

Chicago was chosen as the location of the office for making the survey. Baltimore and Washington were out of the district which manufactured peace time products; practically every plant on the Eastern coast of any great size had been given over to making war materials. It was generally assumed that the war would be over some time or another, at least, and that any survey to be permanent would have to be made on peace time industries. War plants in different sections of the East were putting blind men to work on gauging operations, and the necessity that the manufacturers get production was the very best argument for the employment of the blind. But this did not at all apply to peace time industries, and hence the survey had to be made on industries which were going to be of long duration. New York City was in very much the same condition, except that there were a number of industries around New York which were engaged in their regular production. But the cost of rent and other expenses in the city of New York made operations from New York City almost prohibitive. The Western Efficiency Society and the Society of Industrial Engineers had their headquarters in Chicago, and were in a position to cooperate with the Red Cross by placing us in touch with the managing heads of the industries throughout the country and in practically every line of business.

During the course of this work, the Red Cross has received the help of a large number of trade organizations and technical societies at different times. From the following we have received special help:

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During the course of this work, the Red Cross has received [illegible] societies at different times. From the following we have received special help:

American Society of Mechanical Engineers,
New York City,

Box Board Manufacturers' Association,
Washington, D.C.

Electrical Manufacturing Association,
Baltimore, Maryland,

Society of Industrial Engineers,
Chicago, Illinois,

National Association of Chair Manufacturers
Chicago, Illinois

Western Efficiency Society
Chicago, Illinois

National Foundrymen's Association
Chicago, Illinois

National Association of Metal Trades,
Chicago, Illinois

In addition to this, we have received help in the way of suggestions and lists of members from hundreds of other organizations throughout the country. In this connection, the Detroit Community Union of Detroit, Michigan should be named because of the very active support that they have rendered during the surveys in Detroit. The fact that a body of people of this kind have been engaged in the work of helping the blind appears especially significant, and, if the work is so followed up as to maintain this cooperation, the solution of the industrial problem for the blind is not far distant.

In cooperation with Mr. L.W. Wallace, at that time Assistant General Manager of the Diamond Chain Company, Indianapolis, Indiana, the form shown as Appendix B was worked out and used in the survey of the DiamondChain Company at Indianapolis and the Johnson Chair Company, Chicago. The results in these two surveys were as follows:

PLANT	NO. OF EMPLOYEES	POSITIONS FOR BLIND	NO. MEN NOW WORKING ON THESE POSITIONS*	NO. OF SUCH POSITIONS IN COUNTRY	PERCENT OF POSITIONS OPEN TO BLIND	WORK DONE
Diamond Chain co.	1,000	24	126	400	12.6	steel chain
Johnson Chair Co.	350	19	70	40,000	20	Chairs

PLANT	NO. OF POSITIONS	NO. THEM	NO. OF SUCH POSITIONS IN COUNTRY	PERCENT OF OPEN TO
Diamond Chain co.	1,000 24	126	400	12.6
Johnson Chair Co.	350 19	70	40,000	20

In the latter part of August a meeting was held of a number of executives of Chicago plants who were so situated that they would be able to carry on a more or less technical study of their plants. A number of the men present agreed to make surveys of their various plants and to report to the Red Cross their findings. We had not found office space at that time, and so were unable to give this work the follow-up attention that it required; but as a result of this conference the following surveys were made;

	Tonk Manufacturing Company	Automatic Electric Company
Number of Employees	70-80	2,000
Positions for Blind	5	28
Number of Men Now Working on these Positions	13	115
Number of such positions in Country	600	Several
Percent of Positions open to Blind	16.2	7.8
Product	Piano Benches	Telephones

About this time we were placed in touch with Mrs. Sydney Mc Callin, who had just returned from St. Dunstans in England. We next sent Mrs. McCallin out to some of the plants after she had been instructed in the means of watching operations, and had her make reports on the following forms. Mrs. McCallin was able to cover the following plants with the following results:

	Worms and Loeb, Chicago	Alfred Decker and Cohn, Chicago	Stewart Warner Speedometer Company, Chicago
Number of Employees	20		1,800
Positions for the Blind	1	5	75-90
Number of Men now working on these Positions	10	31	300-350
Number of such positions in the country	Very large		
Percent of Positions open to the blind	50		17-20
Product	Notions	Clothing	Automobile Accessories

As will be seen, the results of these surveys convinced us at once that there was a very large opening for the blind in industry.

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Number of Employees.	70-80	2,000
Positions for Blind	5	28
Number of Men now Working on these Positions	138	115
Number of such positions in country . .	600	Several
Percent of positions open to Blind. . . .	16.2	7.8

. . . . . Three months telephone

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Three Allied Firms
and Parker Pen
Company, Janesville,
Wisconsin

Number of Employees	20		1,800
Positions for the Blind	1	5	75-90
Number of Men now working on these Positions	10	31	300-350
Number of such positions in the country	Many large		
Percent of Positions open to the Blind	50		17-20
Product	Motions	Cloth- ing	Automobile Accessories

As will be seen, the results of these surveys convinced us at once that there was a very large opening for the blind in industry.

During these surveys we discovered that, while we were covering work for the blind, that there were a number of other disabilities which a person could suffer at the same time and still handle the operation, and that the operations varied as to the disability a person might have, outside of blindness. We also discovered, in cooperation with the Chicago Improvement Association for the Blind that in many cases blindness was not the only handicap from which the person might be suffering, and, in these cases, if we were going to be able to determine what a blind person could do, it was extremely necessary to have all the other factors surrounding the operation as well. In co-operation with the Bureau of Vocational Guidance of Harvard University the forms shown as Appendix C were worked out.

About November 1st we took up with the Armour Packing Company the matter of making a study of the occupations of the meat-packing industry.

The Armour Packing Company was anxious to get a report on their plant, showing, not only the work which could be done by the blind, but also the work which could be done by every other type of handicapped man. It had been their purpose to make this study with their own forces, and so we suggested that the Red Cross cooperate with them in carrying on the survey. After a short time it developed that the men employed by the Armour Packing Company for this work had no understanding of the requirements of the job whatever, and when the Red Cross laid out what would be necessary to get a real survey of the plant, the men designated by the Company to do the work, and the officials as well were agreed that no one in the employ of the Armour Packing Company was able to do this class of work. Consequently, the Red Cross made the proposition which was agreed to by the Armour Packing Co. that they would complete the survey with their own forces, provided that the Armour Packing Company would cooperate and see to the placement of the men, according to the findings of the survey.

In starting this survey, it was decided to record the work of the Armour Packing Company on a chart showing the flow of the materials through the shop, on which would be noted the requirements of the job by code in such fashion as to give practically all of the information which had formerly been contained on the individual job sheets taken in former surveys. This was necessary for two reasons:

1. The number of occupations in the Armour Packing Company is so great that any attempt to place the data on our original data sheets would have resulted in such a great bulk of paper that it would have been impossible to get the information from the files.

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by code in such fashion as to give practically all of the informa-
which had formerly been contained on the individual job sheets taken in
former surveys.

2. It was extremely necessary that one be able to gather information quickly and accurately from the sheets. The flow sheet of the material and the organization chart are two things that every employee above the rank of laborer thoroughly understands in almost any plant. He may not know what the flow of material is, or what the entire organization is, but he knows the flow of material in his own department and the organization of his own department. Consequently, it was thought best to make use of this method of charting up the information for the handicapped. The code and charts for the Armous survey are shown as Appendix D.

In carrying on this work in the field, the policy of cooperation with the foreman was always followed, the main idea being to get from them all the requirements of each job that it was possible to get. As the foreman gave the requirements, in order to check him up and to determine at the same time whether we were correct in our deduction, we would begin to ask him questions as to whether those were all the requirements, etc. and finally, by placing him more or less on the defensive, without apparently seeming to do so, get him to discover that on this particular job a blind man, or lame man, or some other type of man would be able to do just as much work as any one else. The men in the field were thoroughly instructed in the fundamental laws of motion, and were taught to make their deductions as to the physical requirements of any man on this basis. These features, however, were not taken up in detail with the foreman on the job, and only the practical questions were asked him. So far as the workmen and foremen of the plant were concerned, the men were very thoroughly sold on the whole proposition.

It should be stated, however, that if any mistake was made at the Armour Packing Company, it was made by providing an engineer free of charge. Inasmuch as the Company did not have to pay for it, the executives in charge were more or less inclined to forget that the work was going on, and consequently, the force of a great many of the methods used was lost on them. The effect in the plant was the opposite of that usually found in other plants, because here the foremen and the superintendents were sold to the idea of employing the blind and handicapped while the executives in charge were still more or less skeptical.

In the course of the survey the following information was compiled:

Department	Employees	Number who could be blind	Number who could have poor sight but not blind	Percentage of positions open to people with defective eyesight
Hog Killing	1050	202	13	20.5
Sheep Killing	717	103	47	20.9
Cattle Killing	1050	36	91	12.1
Tin Shop	652	154	3	24.1
Misc. Departments	4003	152		3.8
Totals	7472	647	154	10.7

In the course of the survey the following information was compiled

Department	Employees	Number who could be blind	Number who could have poor sight but not blind	Percentage of positions open to people with defective eyesight
	717	109	47	20.9
	1080	36	91	12.1
	4008	152		3.8

The number of people employed at Armour Packing Company when this survey was begun was about eighteen thousand. With the signing of the armistice, this force was reduced to something in the neighborhood of ten thousand. It will be seen that if we take the percentage of these various departments, and apply it to the entire force, which would seem to be perfectly fair, we will have approximately 1070 opportunities for the blind in the Armour Packing Company. So far, there have been none of the blind soldiers who desired to work at the Armour Packing Company, or at any other packing house and some of the results of the survey will be lost so far as the blind soldiers are concerned. However, the Board of Vocational Education has received permission from the Armour Packing Company to place two hundred or more handicapped soldiers at Armour's.

As the engineer in the field gathered his data, he set it down in rough pencil chart form, and as he finished each department, brought the pencil charts into the central office, where they were typed up by two blind stenographers, who were employed by the American Red Cross. By carrying on this work with our blind stenographers, we accomplished two results:

1. The blind were trained for this class of work, and trained to be very good stenographers.

2. Before we tried the blind girls on this work, we tried a number of sighted girls, and practically all of them fell down on this grade of work. By the use of the blind, we were able to train our own help, and to train it in the best way, and consequently, got much better and cheaper results than we would have gotten by attempting to employ the sighted.

As a side result of this policy, Montgomery Ward and Company, a large mail order house in Chicago, have adopted the policy of giving a position to every capable blind typist who applies at their employment department, both in Chicago and Kansas City. This, in itself, more than justifies the entire cost of the typing to this office, if the matter is looked at from a broad humanitarian standpoint.

The full Armour report is attached to this report as Appendix E.

After we had been well started in the Armour survey, and had discovered the error of doing the work without payment on the part of the management, a new policy was arrived at. Instead of the Red Cross financing the engineer who made the study, we assumed the attitude of making surveys only in plants into which we were especially invited by the management, and where there was a keen desire

especially invited by the management, and where there was a keen desire
[illegible]
After we had been well started in the Armour survey, and had
[illegible]
ment, a new policy was arrived at. Instead of the had
[illegible]
[illegible]
[illegible]

to have the work done. Then the Red Cross simply furnished the supervision, while the plants were required to carry on the detail work with men competent to do this class of work. Of course, in laying down such a policy, we realized from the beginning that it would be a little slower to get the survey started in a large number of plants, but at the same time the general feeling was that inasmuch as the armistice had already been signed, and as we had a very good idea of where the blind soldiers could be placed, we could take the attitude that it was better to have a few surveys done in such a way that the blind and other handicapped would be placed automatically without the need of outside agencies than to have a large number of surveys made at a very high cost to the Red Cross, and then to have to do our selling work all over again. The first plant to start work on this plan was the Packard Motor Company of Detroit, Michigan. In this case, the idea was introduced by the Detroit Community Union and the selling practically all done by people outside the Red Cross. Our position in this matter was simply the position of following in at the request of someone else. The methods followed were:

1. To study the employment methods and the organization of the employment department of the Packard plant.

2. To carry through a campaign of education among the people in the employment department and among the general superintendents, to enable them to see what the general plan of the survey was to be and to get them fairly in accord with the Red Cross methods.

3. To train the men in the Packard plant in the methods of making surveys.

In carrying on this work the forms shown as Appendix F were laid out to fit in with the Packard Motor Company's general policy.

In order that the Packard Motor Company might be able to determine for themselves the utility of such work, it was decided that the two hardest departments, the forge department and the foundry department should be studied first, and that along with the survey, or shortly afterwards, the placement of the handicapped should proceed. As from actual placements and actual experience the Packard Motor Company learned the utility of the work, the Packard forces were then to proceed with the study on their own account. Men were selected from the general manager's office to make a very careful study of each operation in both the departments, with the engineer of the Red Cross. The findings were then

to have the work done. Then the Red Cross simply furnished the supervision, while the plants were required to carry on the detail work with men competent to do this class of work. Of course, in laying down such a policy, we resulted from the beginning that it would be a little slower to get the survey started in a large number of plants, but at the same time the general feeling was that insomuch as the emergency had already been signed, and as we had a very good idea of where the plant soldiers could be placed, we could take the attitude that it was better to have a few surveys done in such a way that the plant and other beneficiaries would be placed automatically without the need of outside agencies then to have a large number of surveys made at a very high cost to the Red Cross, and then to have to do the selling work all over again. The first plant to start work on this plan was the Packard Motor Company of Detroit, Michigan. In this case, the idea was introduced by the Detroit Community Union and the selling practically all done by people outside the Red Cross. Our position in this matter was simply the position of following in at the request of someone else. The methods followed were:

1. To study the employment methods and the organization of the employment department of the Packard plant.

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3. To train the men in the Packard plant in the methods of [illegible].

In carrying on this work the forms shown as Appendix I were laid out to fit in with the Packard Motor Company's general policy.

In order that the Packard Motor Company might be able to determine for themselves the utility of such work, it was decided that the two Hundred departments, the large department and the foundry department should be studied first, and that along with the survey, it [illegible]. The [illegible] should proceed. We from actual placements and actual experience the Packard Motor Company learned the utility of the work, the Packard forces were then to proceed with its study on their own account. Men were selected from the General Manager's office [illegible] with the engineer of the Red Cross. The findings were then

placed on an organization chart and the blue prints made. The two charts for the forge and the foundry will be found in this report as Appendix G. The following table is a summary of the results obtained from the study of the Packard Plant.

TABLE SHOWING FINDINGS OF SURVEY OF PACKARD MOTOR COMPANY

FORGE AND FOUNDRY DEPARTMENTS

Department	Number of Employees	Number who could be blind or half sighted	Percentage of positions open for blind
Forge	225	15	6.8
Foundry	377	43	11.4
Totals	602	58	9.8

From this it will be seen that even in these two departments there is still room for the blind to work, and it is very safe to say that these are the two least suitable departments in the whole plant, for work of this kind. The officials of the Packard Motor Company have now taken the matter up with the Board Of Directors and are expecting to lay down a policy for the Packard Motor Company whereby handicapped people will be able to work in special positions on the same basis as any other. This will be especially beneficial to the blind, since there are many positions open in other departments for blind men; and if the Packard Motor Company should continue with the survey, which they say they will, this plant will become a place for general employment of the handicapped.

In the case of the Burroughs Adding Machine Company, the work was started through the Secretary and Treasurer of the Company, and referred by him to the General Superintendent. In this case, the entire organization from top to bottom was sold on the idea of the survey before any work was done, and in this plant, we received some of the best of cooperation. The Superintendent, Mr. Kilpatrick in this case, was not content with assigning us one of the younger men of the plant, but assigned us the best efficiency man in the Burroughs Adding Machine Company, a man whom Mr. Kilpatrick was grooming to be one of his department heads. Our representative, Mr. Coates, then spent a considerable amount of time with Mr. Kilpatrick, this man, and one or two understudies, teaching them how the survey was to be made, how the work was to be outlined, and what we thought the work might amount to. The only complaint ever heard from the Burroughs Adding Machine Company was that they had not gotten as much attention on this particular job as they had hoped they would get, that they expected the Red Cross to make greater use of the men assigned to them, and to have driven the survey a little harder.

survey was to be made, how the work was to be outlined, and what we thought the work might amount to. The only complaint ever heard from the Burroughs Adding Machine Company was that they had not gotten as much attention on their particular job as they had hoped they would get, that they expected the Head Office to make greater use of the men assigned to them, and to have driven the matter a little harder.

Mr. Coates, then spent a considerable amount of time with Mr. Kilpatrick, this man, and one or two understrappers, testing them how the proposed new organization of the Burroughs Adding Machine Company, a copy of which we had received from the home office. Our representative, Mr. Kilpatrick was of the best of cooperation. The Superintendent, Mr. Kilpatrick in this case, was not content with assigning us one of the foremen of the plant, but assigned us the best efficiency man in the entire organization from top to bottom was laid on the lines of the survey before any work was done, and in this plant, we received some material by him to the General Superintendent. In this case, the survey, which they say they will, this plant will become a place for general employment of the handicapped.

In the case of the Burroughs Adding Machine Company, the work was started through the Secretary and Treasurer of the Company, and blind men; and if the Packard Motor Company should continue with same basis as any other. This will be especially beneficial to the handicapped people will be able to work in special positions on its expecting to lay down a policy for the Packard Motor Company whereby for work of this kind. The officials of the Packard Motor Company have now taken the matter up with the Board Of Directors and are that these are the least suitable departments in the whole plant, is still room for the blind to work, and it is very safe to say

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Department	Number of Employees	Number who could be blind or half sighted	Percentage of positions open for blind
Totals	608	58	9.8
Foundry	377	43	11.4
Forge	226	15	6.8

TABLE SHOWING FINDINGS OF SURVEY OF PACKARD MOTOR COMPANY

FORGE AND FOUNDRY DEPARTMENTS

from the study of the Packard Plant.

As Appendix A. The following table is a summary of the results obtained charts for the forge and the foundry will be found in this report placed on an organization chart and the blind placed where. The two

The reason for this was, of course, that the Burroughs survey was going on at the same time as the Packard survey, and it was necessary for the engineer to divide his time between the two companies. The work in the Packard Company was nearing completion for the forge and foundry, and it was necessary to spend considerable time in getting the reports and charts drawn up properly. The officials of the Company were thoroughly sold, however, on the whole proposition, and proposed to cover the plants themselves from top to bottom. When it was announced that the Red Cross had decided to discontinue their main surveys, they were very insistent that their men be given a thorough course in analyzing the particular jobs, and stated that they not only regarded this as one of the best business propositions that the Burroughs had had recently, but that this was one big opportunity for the Burroughs Adding Machine Company to do some good. The charts which have been drawn up so far from the Burroughs Adding Machine Company are enclosed herewith as Appendix H.

While the quantity of work turned out has not been so very great, still the progress here has been on a sounder basis than in any of the other companies mentioned, for the reason that the employment manager himself proposes to check up the survey men on about every 25 to 50 positions, by starting to place men on the jobs that they have stated could be handled by the handicapped, and putting the man who made the survey on the job to take care of the training. This will apply to the blind as well as to every other form of handicapped man. The first proposition is to correctly place the men who are now employed by the Burroughs Company, and who are improperly placed, and then to follow the matter up by taking people in from the outside, first soldiers and then civilians. This program will eventually mean the employment of all the blind in that section of Michigan, provided this employment is needed in the one plant.

Strange to say, before the survey was started, one of the iron clad requirements of the Adding Machine Company of any employee was that he have almost perfect eye sight. On the machines that they were most insistent about eye sight, they have now found the requirements to admit the blind.

The Goodyear Tire and Rubber Company's survey was made on a different basis than any of the others. The Goodyear Tire and Rubber Company have one of their foremen, Lieutenant Day, blinded, and in training at Baltimore. Mr. L.W.Wallace called upon the Goodyear people at Akron and explained to them the nature of our surveys and what we were expecting to do for the blind. This, at once, interested the Goodyear Company, from the personal standpoint of Mr. Day, and they asked Mr. Wallace to start a survey of the Goodyear Company.

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found the requirements to admit the blind.
that they were most insistent about eye sight, they have now

Strange to say, before the survey was started, one of the iron clad requirements of the Adding Machine Company of any employee was that he have almost perfect eye sight. On the machines

in the one plant.
in that section of Michigan, provided this employment is needed
this program will eventually mean the employment of all the blind
taking people in from the outside, first soldiers and then civilians.
who are improperly placed, and then to follow the matter up by
place the men who are now employed by the Burroughs Company, and
other form of handicapped man. The first proposition is to correctly
the training. This will apply to the blind as well as to every
and putting the men who made the survey on the job to take care of
jobs that they have stated could be handled by the handicapped,
about every 25 to 30 positions, by starting to place men on the
employment manager himself proposes to check up the survey men on
any of the other companies mentioned, for the reason that the
great; still the progress here has been on a sounder basis than in
Burroughs Adding Machine Company are enclosed herewith
as Appendix H.

While the quantity of work turned out has not been so very

far from the Burroughs Adding Machine Company are enclosed herewith
company to do some good. The charts which have been drawn up so
that this was one big opportunity for the Burroughs Adding Machine
best business propositions that the Burroughs had had recently, but
jobs, and stated that they not only regarded this as one of the
their men be given a thorough course in analyzing the particular
to discontinue their main surveys, they were very insistent that
proposition, and proposed to cover the plants themselves from top
to bottom. When it was announced that the Red Cross had decided

A little later, the undersigned made a trip to Akron and talked the matter over with the safety engineer and with the other officials of the employment department, with the result that the Goodyear Company agreed to furnish the men to make the survey if we would furnish the supervision. The question was brought up as to whether they would rather have the undersigned to come to Akron at stated intervals of once every two weeks, or thereabouts, or whether they would prefer to have a man resident on the field to take care of the work, and have the undersigned visit him once each month. The attitude of the Goodyear Company was that they had in their own employ men who were perfectly capable of taking care of the detail work, and who understood the general policies of the Goodyear Company, that the resident man would not be of any particular use to them, and that they would very much prefer personal supervision on that job, because they wanted to be sure their man was placed right.

The men then selected were men from the plant who had come up through the ranks and who had been taught time study work, and general survey work. While at first it seemed as though these men would hardly have the educational foundation to handle the work well, still the results obtained have been very satisfactory. The Goodyear Company at this time was carrying out job analysis of their entire plant in which they were giving a very full description of every position. The idea suggested to the employment department was that they include the physical qualifications along with the remainder of the description. This seemed a very good idea, since the men who were working on the employment department would thoroughly understand the meaning of the physical qualifications, and could use it in their actual employment in the shop. The copy of this sheet is here shown as Figure 1 of Appendix I.

It was further suggested that some means be arranged whereby positions requiring certain qualifications might be picked out easily, so that when a man applied who was handicapped, the qualifications which he possessed could be balanced against the requirements of some position in the shop. This was arranged and worked out in a card used by the Findex Company of San Francisco, California, and shown herewith as Figure 2 of Appendix I. This card has not yet been adopted by the Goodyear Company, as they are going to experiment first with their sheets as they stand to see whether this will not be sufficient. It was not long after the first survey was started, before it was discovered that in the tube room, there were a large number of positions open for the blind. The Goodyear Company at once siezed upon this opportunity and suggested that Lieutenant Day be broken into one operation after another in the tube room, and as fast as he was able to work into a second position that he train a blind man in the position that he had just left, and that Lieutenant Day become the head of the blind colony in the Goodyear Tire and Rubber Company. As the Goodyear Company already employs a

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man to take care of the mutes, of which they have some five hundred, this was not a very radical departure from the Company policy, and it seemed the best opportunity that could possibly be found for Lieutenant Day. As there are openings for some four or five hundred blind people in this one department, this in itself would take care of all the blind that would ever wish employment in that section of Ohio.

Since that time, the Goodyear Tire and Rubber Company have completed a great many more studies and have held these sheets in their employment folders. It might be said in this connection that the surveys have also resulted in the Goodyear Company being able to properly place the men who have been handicapped in their own employ, whom they thought were improperly placed, and a general program is now being followed out by the Goodyear Company whereby first their own men will be placed according to their qualifications, next soldiers who have made application for employment in the tire company, next the civilians. This Company plans to eventually take care of all the handicapped in the city of Akron who will work at the Goodyear Company.

The Stearns Drug Company of Detroit were in the same position as the Goodyear Tire and Rubber Company, although the man who had been blinded from the Stearns plant was not a man of the same grade as Lieutenant Day; but had been working most of his time in the Stearns plant on a routine machine operation. In this plant, the only survey was made by going through the plant, estimating the percentage of occupations open to the blind, and finding one occupation for which this man could be properly fitted. The Stearns Drug Company is a wholesale drug house and a vast majority of the people employed are women, where the wages paid are rather low. There were only a few jobs for men in the plant, and outside of the work for the civilian blind, it hardly seemed worhh while to make a survey of the entire plant. Furthermore, at that time, there was a serious question as to the surveys being continued at all, and it was thought best to be satisfied with finding a position which a blind soldier could handle.

At the present time all surveys have been discontinued, and the results are being forwarded to Baltimore with this report. If the Red Cross should desire to do so in the future, almost any of these surveys could be picked up and carried on from their present data. At the Goodyear Tire and Rubber Company, the Burroughs Adding Machine Company, and the Packard Motor Car Company there is but little doubt that the surveys will be continued by the companies' own forces. When these are entirely completed, all these companies have agreed

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to send to the Red Cross the completed surveys with all charts, and to cooperate with the Red Cross or anyone whom the Red Cross may designate in the placement of blind and other handicapped in their plants.

Gauging the possibilities in other industries by the information gained in the surveys named above, it would seem that between ten and twelve percent of all the occupations in the United States were available for the employment of the blind. If this be true, the question becomes not one as to whether the blind man can work in industry, but becomes simply one as to how he is to successfully placed in industry, and becomes a very much simpler problem because it becomes one of detail, and not of policy.

Long before the war, Mr. F.B. Gilbreth of Providence, Rhode Island, had been working on the motion picture machine as a method of measuring the time required for different motions. The work had been reduced to an exact science, and it was through these pictures that Mr. Gilbreth discovered that a blind man could be trained to work on an operation with equal speed to that of sighted, and it was due to his discovery that the methods used by the Red Cross were worked out in handling these surveys. The method of handling these motion picture measurements is briefly as follows:

1. Pictures of the operator, working at maximum speed and maximum advantage, are taken in a laboratory at from sixteen per second to four hundred per second, and in the picture is a clock which measures time to one two-thousandth of a minute.

2. When the pictures have been taken, they are developed and printed, and

3. Projected onto a screen as individual lantern slides, and charts made showing the motions that were made by each part of the body during the operation.

4. These charts are then checked against the fundamental laws of motion and the losses, due to false motion, are determined. With the chart of actual conditions to check against the standard conditions, the losses in the operation are perfectly obvious. Furthermore, the pictures form an accurate record which enables the teacher to teach the methods of the expert operator. Inasmuch as expert operators are very seldom expert teachers, this forms a very happy combination.

New methods are easily discovered when once the use of the charts is thoroughly understood, and it is very seldom that the operation can be gone over in this way without discovering some new method of doing the work. If the man studying the chart has the blind in mind, and studies the operation to determine how the work can be done without eyes, he is almost sure to find some way of carrying out the operation, and overcoming any difficulties that may arise.

Long before the war, Mr. R.S. Wilbreth of Providence, Rhode Island, had been working on the motion picture machine as a method of measuring the time required for different motions. The work had been reduced to an exact science, and it was through these pictures that Mr. Wilbreth discovered that a blind man could be trained to work on an operation with equal speed to that of sighted, and it was due to his discovery that the methods used by the Red Cross were worked out in handling these surveys. The method of handling these motion picture measurements is briefly as follows:

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Perhaps the best use of these pictures with the Red Cross has been their utility in teaching survey men to size up jobs in the plants. When once a man has been able on the pictures to check the standard operation, and to detect faults, he then finds it a great deal easier to do the same thing when he gets out on the job and watches the operation in this way. The reason for this is that he is trained to look for the right things in the operation, inasmuch as he has very definite standards by which to gauge his work. He is permanently fortified against making an error.

It may not be out of place at this point to make a few suggestions as to the proper method of following up this work.

Take the surveys that have already been made, place the blind in the occupations to which they are adapted, and get a good teacher to train them to get a little more production on each job than the sighted man. Then through the trade papers, as shown in your classification of industries, advertise throughout the country what has been done, by means of articles and publicity notes of various kinds. Provide the workers for the blind with a list of the industries which have been surveyed and results obtained on placements of each, and allow them to use the data in placing the blind in their own section.

Within the last few weeks, the Red Cross Institute for the Blind has cooperated with the Chicago Light House Association in following up these surveys, with the result that the blind have been placed almost as rapidly as they were supplied to the placement agents, and in practically every case, the blind men have made good. The pictures shown as Appendix J will give some idea of what the results of this work are. There is absolutely no reason why this should not be repeated in every city in the United States, almost with the data which is now at hand, and the work in Chicago has only just begun. The Chicago Improvement Association for the Blind has placed a man on their pay roll who is placing the blind in Chicago, and within a short time the blind in Chicago will cease to be a problem as far as the industrial side is concerned.

It has seemed necessary to your Committee and to Mr. Wallace, the General Manager of the Red Cross School, to retrench. I now believe that these surveys have been sufficiently advertised and have gained sufficient prestige that other firms are willing to pay for work done along this line, and consequently in order that we may retrench to

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the best advantage, I am opening an engineering office in which we will go a great deal further than we have gone in these surveys for the Red Cross, inasmuch as we will get to the bottom of the business policies of the firms. In the course of this survey, the qualification requirements of all of the employees will be determined. In these firms where we are employed, we can then co-operate with the various agencies in placing the capable handicapped into the employ of these firms, thus, in the end, performing the same work that has been performed by the Red Cross by continuing these surveys, free of charge to the Red Cross. There is not any reason whatever that the Red Cross Institute, if it so desires should not make available to other concerns the data which we have uncovered during our work, so that other engineering firms may be prepared to do the same thing, and speed up the work of educating American industries and American social organizations to the possibility of the blind and handicapped in industry. At the present time, there is a big labor shortage developing in the country, and our experience so far has been that the ability to make use of the handicapped and to furnish a new labor supply is a very strong argument to the average employer. At the same time, the force which has been employed on these surveys will be available to the Red Cross at any time they may wish to continue the surveys as they have been carried on in the past, and available also for cooperation with the Red Cross in carrying out placement problems.

As a future program in following up these surveys, I would recommend:

1. That the Classification of Industries furnished you in this report be published in all the trade papers of the U.S. and criticisms solicited, so that the classification may be corrected at a comparatively small amount of expense.

2. That as the data comes in, the trade papers and trade organizations be properly indexed, together with all information which can be obtained regarding the means of publicity of the RedCross program.

3. That the results of the present studies be given wide publicity in the various trade papers, following up the general program laid down in the second portion of this report, known as "Methods of Survey."

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3. That the results of the present studies be given wide publicity in the various trade papers, following up the general program laid down in the second portion of this report, known as "Methods of Survey."

4. That the blind institutions throughout the country be afforded the cooperation of the Red Cross Institute for the Blind in handling their placement problems, either on a basis of their paying for the actual cost of the work, or on the basis of the Red Cross paying for the cost of the work from the general fund.

5. That the motion picture studies be enlarged to include those occupations on which the Red Cross expects to specialize and that the work of the blind, thereby, be made equally as efficient as the work of the sighted.

6. That propaganda be opened among the various engineering firms of the country to obtain their cooperation in extending the placement and the survey work for the Red Cross.

7. That each case of successful placement of the blinded soldiers be made use of to place civilians, by proper publicity, as shown under the subject of "Methods of Survey."

8. That means of cooperation be established with the various foundations, with philanthropic organizations, and with other agencies interested in the handicapped, whereby the work which has been done by the American Red Cross and which is applicable to the common problems of humanity be made available to all other institutions of the country.

This office is at the service of your committee and of humanity at all times, and my only desire is that you shall make the fullest use possible of the service that we may be able to render.

Respectfully submitted,

A.B. Segur, Industrial Engineer,
Red Cross Institute for the Blind

5. That the motion picture studios be enlarged to include those the work of the blind, thereby, be made equally as efficient as the work of the sighted.

6. That provisions be made among the various legislative Bills of the country to obtain their cooperation in extending the placement and the survey work for the Red Cross.

7. That each case of successful placement of the blinded soldiers be made use of by Red Cross civilians, by radio publicity, as a case under the subject of "Methods of Survey."

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Respectfully submitted,

Red Cross Institute for the Blind

REPORT

INTRODUCTORY

In making the survey of American industries for the Red Cross Institute for the Blind, a number of policies had to be set and methods determined upon at a relatively high expense. The work of determining the best method of handling some of what were then knotty problems has been done. In order to preserve the information so that it will be possible for the Red Cross to continue the work, or for any other agency to make the necessary survey to take care of social and industrial problems, we have written this report. The first two portions, namely, Industrial Classification and Survey Methods, are worked out entirely for the American Red Cross and no private individuals are involved in any way. The third part, that on Time Study, was worked out by Mr. F.B. Gilbreth of Providence, Rhode Island, for his personal use as Industrial Engineer. The Red Cross received permission from Mr. Gilbreth to make use of this data in order to take care of the problems of the handicapped, and for no other purpose. Judgment should be used, therefore, in publishing that feature of this study.

The report will be found in three divisions:

I. Classification of Industry

II. Methods of Survey

III. Motion Study Methods

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CLASSIFICATION OF INDUSTRY

The generally accepted idea of the people of the world today seems to be that every industry is different from every other, and that it is very difficult if not impossible to exchange data or to transplant conditions from one industry to the other. The people who are most radical in this view are very likely to be the managers of large plants, who are thoroughly acquainted with their own industry, but who have paid very little attention to any other. On the other hand, there is another group of people who are not so very well acquainted with industry, who seem to believe that a factory is a factory no matter where it exists or what it manufactures, and that when they get a group of manufacturers together, all that is necessary is to tell them to do a certain thing, and that, forthwith, every manufacturer in that group is able to carry through his part of the program. It is very evident that both of those theories are erroneous, and that there is a happy medium between the two which is more nearly correct. Industries vary very greatly as to products manufactured and raw materials used; they also vary very greatly as to the mechanical details in each individual plant. On the other hand, there is a large amount of similarity in various industries. In fact, where the product is the same and the raw material the same, the differences in the mechanical processes within each plant is likely to be but very slight. Furthermore, when you branch beyond the general layout of the plant, and get down to definite processes, you find hundreds of points within different plants where the plants are alike. For instance, in the iron and steel industry, the punch press is one common form of machine, the lathe another, and the milling machine another. Punch press operations are essentially the same whether performed in a plant manufacturing tin cans or one manufacturing parts for watches or adding machines. To be sure, there is a difference in dies, and a difference in the limits of accuracy, but these limits are more or less slight when the big features are considered. As you approach closer and closer to a similarity of products and a similarity of raw material, the differences between the punch presses gradually disappear, until, when you reach the point where two firms manufacture almost the identical product, are strong competitors, and use the same raw material, the punch presses are so nearly alike that none but an expert would be able to detect the difference, and so far as the operation is concerned, a man who was able to operate a punch press effectively in one plant would be very likely to operate the same punch press effectively in another plant.

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The same rule holds true in the case of order systems. The elements of an order system are practically the same in all plants having the same general type of problems to meet. For instance, it makes but little difference in your order system whether you are manufacturing for styles or for specialties in automobiles, or in furniture. The essentials of your order system are the same.

From the standpoint of manufacturing problems, manufacturing plants in this country divide themselves briefly into the following divisions:

1. Straight line production. This is the type of production in which the product passes from one process to the other without any material difference resulting between different types of finished products. The approach to this general method of production varies by degrees, the leading method being as follows:

A. Single product. One machine tooled up for each process on each part. Material run through on large lots sufficient to keep machine going steadily without any change in the setting. Whenever a plant can be lined up for this type of work you have, of course, the most economical type of production, since it is possible to work out automatic machinery with perfect safety without thinking of the cost of changing the set of the machines.

B. One or more products where at least one man is employed on each process on each part.

2. Job shop production. In this type of production there is no order in which the goods go through the plant, since the type of production will change with every job that comes into the factory. The difference between straight line production and job shop production is largely one of degree. For the purpose of making surveys, all production can be considered job shop production, unless it follows the A and B grades of straight line production.

It is this division rather than the product division that indicates the difference between plants.

The question of credit is the same in different lines of industry wherever the same marketing conditions exist, whether the credit be for lead pencils, for waste baskets, for tissue paper or for drug specialties; and credit information from one industry is spread to another. In other words, there are two lines of cooperation between industries:

the same role holds true in the case of other systems.
the elements of an order system are practically the same in all plants having the same general type of problems to meet. For instance, it makes but little difference in your order system whether you are manufacturing for sales or for your order system are the same.

Upon the standpoint of manufacturing problems, manufacturing plants in this country divide themselves briefly into the

1. Straight line production. This is the type of other without any material difference resulting between different types of finished products. The approach to this general method of production varies by degrees, the leading method being as follows:

   a. Single product. One machine tooled up for each process on each part. Material run through on large lots sufficient to keep machine going reasonably without any change in the setting. Whenever a plant can be lined up for this type of work (on lines, of course, the most economical type of production, since it is possible to work out automatic machinery with perfect safety without thinking of the cost of changing the set of the machines.

   b. One or more produces where at least one man is employed on each process on each part.

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The application of credit is the same in different lines of industry wherever the same marketing conditions exist, for instance it may be for local peculiarities; and credit information for large markets, for other words, In other words,

1. The line of products.

2. The line of specialization.

The manufacturers and employers generally of the United States are coming more and more to see this view, and today you have such organizations as the National Association of Credit Men, the Salesmanagers' Association, etc. Perhaps the lines along which the manufacturer and employer has been best educated as to the possibilities of cooperation, are the lines of products and raw material. Here, we have the powerful trade associations working on the entire subject of factory management and marketing, the reason, of course, being that these form lines along which managers have been thinking for a long period, and along which they feel more or less of a community interest. Other points of contact in the formation of industrial organizations are generally raw material, final products, methods of processing, organizations and character of labor employed. Plants in which these conditions are similar generally have trade organizations or have someone connected with industry who is thoroughly acquainted with everyone else connected with the industry, and who is, therefore, in a position to get the maximum of cooperation in any general movement which may be started among this group of employers. These men may be separated by distance, but are drawn together by a common interest in their problems. It is along these lines that trusts and labor organizations are formed. It is also along these lines that the general public thinks of the manufacturer. In this country the spirit of cooperation is taking the place of the spirit of competition very largely in many industries, and if you want to find the man with whom the employer is likely to cooperate and exchange information, just go to the man who was his strongest competitor fifteen years ago, and you will very likely find him.

But back of these smaller divisions are larger groups; for instance, chair factories have their own organizations in which they discuss the manufacture of chairs, but they are also interested in the furniture business as a whole, and conferences may also be found of the chair manufacturers with other men in the wood working business. In turn the wood working industries are very likely to be found in co-operation with producers of forestry products as well as manufacturers and dealers. People interested in forestry products will be found in cooperation with the iron and steel industries, and so, by going back far enough, along the chain, you will pick up a common point from which all cooperation must start in order to get the maximum of results.

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Nor are trade organizations the only evidence of this cooperation. Note the trade journals. You will find in the iron and steel industry, for instance, "The Iron Trade Review," and "The Iron Age," which will be found on almost every desk where a man uses iron and steel in his products. Further down the line, you will find the smaller trade journals, which deal with a more restricted field and have a more restricted circulation, and even further down the line, you will find journals dealing with an even more restricted field such as the "Hardware Review." Then there is the journal which deals with a specialty only, and which may be published simple as the organ of some trade organization. There are thousands of these journals, practically all of them following these lines, and if one wishes to determine the proper division of American industry, it is almost necessary that they get a complete analysis of American trade journals. Another line of cooperation that is often found, especially in the trade journals and trade organizations is the line of geographical location. For instance, we have the Western Retail Lumbermen's Association, Northern White Cedar Association, Southern Logging Association, and the Western Pine Manufacturers' Association, while the members of all of these will probably belong to the National Lumber Manufacturers' Association. Among the journals, we have the Southern Lumberman, the West Coast Lumberman, the New York Lumber Trade Journal, and the American Lumberman.

If then we desire to sell any particular idea to the industries of the United States, it is necessary to cover this work logically from every angle, so that no matter which particular activity the man in question is following, he will hear of your idea in some way, whether it be in his trade journals or his trade organization. This means, of course, the preparation of thousands of articles, but, after all, it is not so difficult as it may seem at first sight for the reason that many of the articles can be duplicated in different journals. For instance, there is no reason that an article appearing in the "Seed Trade World," should not at the same time appear in the "American Lumberman" or the "Iron Age" for the reason that probably not one subscriber to either paper will over see the other paper, and, as a general rule, the editors do not exchange papers.

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will ever see the other paper, and, as a general rule, the editors do not exchange papers.

Such articles would have to be more or less general, of course, but articles dealing with generalities and in applications of a wide variety of industries are easily arranged, and will always form the entering wedge in places where the opening has not yet been created. After the opening has been created in any line of industry, it is then possible to take the application from that particular industry and work first with the technical journal and then with the trade journal. When the articles have been published in this particular line of business, the same thing can be reworded and placed in the magazines having to do with the larger field; and so on, a campaign of propaganda can be carried on which will sell the idea in other lines of business as well. The possibilities for this sort of work are almost unlimited provided you have a classification of industry made up with this in mind.

Furthermore, the application of work of this sort greatly reduces the amount of surveying that is necessary to be done in order to cover a large range of industry; for instance, if you cover thoroughly a large representative packing house, you have covered the majority of processes that you will find in almost any food canning establishment in the country, and all that is necessary for the local workers to do where more canning establishments exist, is to study the slight differences between the large plants and the smaller ones. Inasmuch as there are food canning establishments scattered through almost every state in the Union, it will be seen how great are the possibilities for placement of the blind when once one large packing house has been covered, especially when placement begins and is successfully carried out.

While there is a considerable amount of cooperation on different problems between plants, still there is a great deal of competition between different divisions as well, and one plant never likes to be outdone by the other. If the reconstruction problem is a popular thing in industry at the time, or in the community, and one firm carries out a piece of construction successfully, another firm is very likely to fall into line and to carry out the reconstruction work in their plant so as not to be outdone, and to show that their organization is just as good as the other fellow's organization.

The same principle of competition applies where one large plant makes a big success at placement. The more progressive of the smaller plants are at once trying to emulate the big plant, and to show to the public generally that they can do the same thing that the big fellow can do, and are very likely to carry on their placements along these lines. When, of course,

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the smaller man has succeeded in carrying out the placement program, the other men are almost bound to drop into line, and the campaign has been more effective over a wide range of territory.

The trade organizations have been mentioned above, but these again form a very good source of cooperation. When once a powerful member of a trade organization has been thoroughly sold on the question of the placement of the blind or handicapped generally, or on any other piece of progressive employment policy, the trade organization is very likely to get behind the work for their organization, with the very natural result that other less progressive plants throughout the industry will fall into line and carry out the same class of work with the experience of the first man behind them, together with the backing of the trade organization.

Furthermore, the working out of a proper classification makes a convenient means for the circulation of information. When two competitors get together to talk things over, the thing that they are not going to be very reticent in talking about is the thing that does not give either a handicap in competition. Consequently, such a thing as the placement of the blind or the handicapped is very likely to be a fruitful source of conversation, which, after all, is the best type of advertising.

The reputation of any placement agency, such as the American Red Cross is also either made or unmade through these trade bodies. If the organization is successful at one point, the reputation for having done a good piece of work reaches throughout the industry, while if it is unsuccessful at one point, a bad impression is created. It is very important in carrying out the big general program in those industries to know along what line this cooperation will follow in order to be able to carry out a logical program.

After all, the problems of the manufacturer or employer and those of the social agency interested in placement work, are much the same. The employer needs the competent help, and the placement agency needs the place for workers who can be made competent. It only requires that these bodies get together in order to cooperate to the best advantage. When once cooperation has been established, the results can be made very widespread.

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An example of these possibilities will be illustrated in several different places. For instance, the Johnson Chair Company of Chicago placed a blind man in their finishing room. The man worked regularly, turning out satisfactory work for about six months, and then the Karpen Furniture Company of the same city took on first one man and then three more in their finishing room and other parts of the factory, very largely because the man proved a success at the Johnson Chair Company. The four men are working successfully today, and both plants are open to the employment of the blind.

The Edison Electric Company managed to place two men very successfully on some of their assembly processes. It had not been more than a week before the Automatic Electric Company of Chicago had negotiations on with the heads of the Union in their plant to allow the employment of the blind in the Automatic Electric Company. Blind men are now employed and have been admitted to the Union.

As an illustration of the danger to be encountered along this line will be found the example of a paper box manufacturer. In this case the man supplied for the job was a man who did not have the proper spirit toward his work. He was placed on a job, and even though successful in handling the operation, manifested such a bad spirit toward the work in general, that he had to be dismissed. The second man that was called in proved also to be a failure because he had never learned to keep business hours. Very naturally, the first box company pronounced the plan a failure, and it has been very difficult to deal with box manufacturers in the city of Chicago since, and will continue to be until someone is able to induce another box manufacturer to try the experiment again. If a similar mistake is made in the man selected, the paper box factories will probably be closed to the blind.

In carrying out such a classification of industries, it is always well to obtain all the information that is common to the trade before starting to gather outside information, because this in many cases will give you the date which you require. It is not necessary, of course, to address all of the firms in any one line, but your best plan is to take some directory like Thomas'Register, and send a letter or questionnaire, something on the order of the attached Form 4, to the leading firm in each group as listed in the directory, being careful, of course, to see that it is not duplicated in any case. The information which comes back from these questionnaires will give you a lead which will enable you to follow up your classification still further. In case you do not hear

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from the first firm, it is generally wise to send the same questionnaire to the second firm in the line, and at the same time, to write a letter to the first firm explaining what you want the information for, and that you are only asking the general data regarding the lineup of the business. As you receive the answers to the questionnaires, you can lay out your tentative classification, and change this from time to time as the information may seem to warrant. It is impossible, however, to handle any big topic of this kind wholly by the method of questionnaires, and conversations and interviews are extremely important. In fact, it is generally wise, after you have received a letter giving you a lead on a proper classification for any industry, to visit the Secretary of the trade organization which represents this particular industry and get him to check your idea of the classification, provided the firm to which you wrote does not give you the data regarding the classification. In many cases, the trade secretary or the editor of the trade journal to which he refers has the data and can give it to your readily. Before attempting such a conversation, the information which is desired should be carefully arrived at, and the interview shaped accordingly.

Still another method of arriving at a means of classification is to take the advertisements appearing in technical journals covering a wide range in any line, and to determine all of the products that they represent. Then determine where each product gets its raw material in order to fit into the proper position in your classification. When this has been done, you can check your ideas of the classification against the trade directories, thus discovering a new point of classification. This does not always hold, however, and most of the work that you do in checking against the trade directory is to eliminate the classifications that you have gained from your advertisements; but if your idea is to get a complete classification, such measures are almost absolutely necessary. A fruitful method of getting a list of this kind is to go to large department stores of various kinds, and get from them a list of all their products, together with the people from whom they purchase these products. This will give you immediately a lead as to their classification, and perhaps give you a new idea that you would not have gotten in any other way. Department stores, if they will consent to take the time for such work, are very good sources of information. Another source that is equally good, if not better, is the mail order house. The mail order houses of this country cover very

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wide ranges of products in which they deal. By going through the mail order catalogue, and by getting in touch with the department heads of the mail order house, you will be able to determine where their different products come from. It is very seldom wise, in this case, to try to get all the information from any one man in the mail order house, since most of our mail order houses are organized in such a way that each man is responsible for the purchase and sale of the products in his particular department, and there are very few people outside of this department head and his assistant who know much about the products in that department.

The trade journals form another very fruitful source of information. The trade journals are especially good, because by their very nature, they are already partially classified, and contain information regarding firms which are in the same line, or who wish to sell something to the people who are in this line. This gives an idea as to the source of the raw materials that are used in that particular industry.

Nor are the columns of the paper the only source of information regarding classification which can be obtained from the trade journals. The editors of these journals have in order to exist, to follow their fields very closely, and have to be perfectly familiar with everyone in the line, and everyone who might advertise to anyone engaged in that particular line. In many cases, you may be able to get them to give you the list of the firms which they have in their present files. If you can do this, your classification for this particular item is almost complete, because an up to date technical trade journal generally has its information fairly well classified.

The engineering papers, especially those along management lines, are very useful, because they contain a wide diversity of advertisement, and the ads are generally written to appeal to the people with critical minds, especially along the lines of analysis, and are expected to be more clearly defined than in almost any other periodical.

The popular magazines form a fruitful source of information, largely because of their diversity. The advertisements are written to appeal to the popular mind, and not with very much idea as to their use for classification purposes.

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The beginner in research work will soon become familiar with the writers of their literature. The advertisements are written to appeal to the normal mind, and not with very fine idea as to their use for financial motion purposes.

Classified telephone directories, while the classifications are generally very crude and cannot be used for an industrial classification direct, are still well enough divided to give an excellent means of checking up any ideas on classification that you may have.

When you reach a large group of industries such as represented by the textile industries, or the iron and steel industries, it is necessary to get someone inside of the line who has made a study over a wide diversity of plants for several years, to give you the proper classifications, as the divisions, in many cases, are so finely drawn that none but the expert is able to find their proper dividing lines.

It is necessary to meet people who are already in the trade before arranging such classifications. While most people are fairly well acquainted with their own line of business, very few have any acquaintance whatever with the other man's line of business, and things which seem very simple to one man are great problems to another.

The classifications which are extant are very good for the purpose under which they were drawn. Most of these classifications are drawn for the purpose of selling commodities, and are not so finely drawn as is necessary for the purpose of handling big movements such as the movement for the handicapped.

The people who arrange the classifications, as a general rule are but little interested in the plant and processes classification for the simple reason that so long as their party may be in the market for their particular machine or group of machines, it makes but little difference whether the plant is large or small, whether it manufactures by one process or another. When you are placing the blind, however, it is extremely necessary that you know not only that a firm manufactures a certain product, but that you have more or less of an idea of how the product is manufactured. If you are going to apply the findings of one plant to another, you should know more about the similarity between the two plants than does the man to whom you are trying to sell the idea. The reason for this, of course, is that when you appeal to him, he is going to be

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in a very critical mood. This method of employment is something to which he has not been educated, and employers generally resent anything new along their own lines. If he can pick out flaws in your argument which show that you are not well acquainted with the conditions that exist in his trade, he is going to find more objections to your plan than one could possibly overcome, most of which are purely imaginary. If, however, you show by your general knowledge of the subject, that his plant is practically the same in process as well as in products as the other man's plant, who has made a success of placement of the handicapped, he will be disarmed before you start in, with the very natural result that your placement problems will be very much simplified.

Such classifications are of but very little use unless they are complete within any particular line, for the simple reason that, if your classification is not complete, there is every possibility that the item which has been left out is the item which will change the classification possibilities entirely.

When your classification has been arranged, it is then important that you gather from the inside of the trades all of the information that can be made available as to the peculiarities of the trade, such as a list of names of people engaged in the trade, the people who sell to the trade, sources of raw materials, sales, exports, imports, and anything else which may give you an idea as to the conditions under which the handicapped would be placed. This is particularly true in getting the names of trade organizations, the names of trade papers, and other such items.

Perhaps the most common error in work of this kind is that of obtaining incomplete lists of names and of getting inaccurate data based upon some one person's prejudice. Eternal vigilance is necessary to obviate this possibility and such information concerning trades should be kept up to date at all times. If this is not done, many important firms will be left out of your classification, and consequently many possibilities for the employment of your people will be left out. It is always wise to follow newspapers, trade reports, credit reports, and other sources of information to find out new firms and to check up on the existence of old ones. The classification of industries as arrived at by the Industrial Division so far is attached as Appendix A of this general report.

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which the handicapped would be placed. This is particularly true
of raw materials, sales, exports, imports, and anything
engaged in the trade, the people who sell to the trade, sources
peculiarities of the trade, such as a list of names of people
of the information that can be made available as to the
important that you gather from the inside of the trades all
Perhaps the most common error in work of this kind
is that of obtaining incomplete lists of names and of getting

in putting the names of trade organizations, the names of

else which may give you an idea as to the conditions under
in a very critical mood. This method of employment is something
to which he has not been educated, and employers generally resent
anything now along their own lines. If he can pick out flaws in
your argument which show that you are not well acquainted with
the conditions that exist in his trade, he is going to find
more objections to your plan than one could possibly overcome.
most of which are purely imaginary. It, however, you show by your
general knowledge of the subject, that his plant is practically
the same in process as well as in products as the other man's
plant, who has made a success of placement of the handicapped, he
will be disarmed before you start in, with the very natural result
that your placement problems will be very much simplified.

Such classifications are of but very little use
unless they are complete within any particular line, for the sim-
ple reason that, if your classification is not complete, there
is every possibility that the item which has been left out
is the item which will change the classification possibilities
entirely.

When your classification has been arranged, it is then
important that you gather from the inside of the trades all
of the information that can be made available as to the
peculiarities of the trade, such as a list of names of people
engaged in the trade, the people who sell to the trade, sources
of raw materials, sales, exports, imports, and anything
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This is not at all complete, inasmuch as the work was called off before we could finish the job, but it will give some idea to anyone else who wishes to complete the work. It will be noticed that we have started with the source of the products, using Agriculture in its very broadest sense, Mining in its very broadest sense, and Services. Each of these is divided into natural divisions and from these the different classes of products can be worked out down to the point where they reach the ultimate consumer. The applicability of this scheme of classification can be very readily seen. Suppose that a blind man has been put to work in a chair factory where the firm manufactures office chairs. The fact that this has been done can be spread through the whole chair industry through the medium of the National Chair Manufacturers' Association. Then the facts can be published in the "Furniture Manufacturer and Artisan," and the "American Furniture Manufacturer" trade journals. Following this, the same information can be published throughout all of the divisions that come in the same line of wood products, and following that, in the lumber trade journals. There are 100,000 people in the United States in the wood working trades, it will be seen that if 18 percent of the people employed in the wood working industry can be blind, the possibilities in the wood working industry are sufficient to give employment to practically every capable blind man in the United States who is still looking for a position. Still, the whole start for the propaganda can be based upon the survey of one furniture plant, and the proper follow-up in that one plant, together with the offer to the remainder of the people in the wood working industry to cooperate with them in any survey they desire to follow out.

A similar scheme used on other lines of industry would produce similar results. It can be safely stated that one hundred surveys made in the right plants in the country with the right follow-up and the right cooperation would probably place every blind and handicapped man in the United States within a comparatively short time. When such a scheme is followed up, however, it must be done with the cooperation of everyone, and with no question being raised whatever as to who is who. It is impossible to carry out a scheme of cooperation of this kind if several agencies in the field are trying to obtain the credit for having done a certain piece of work without having produced the goods.

Nor are the benefits to be obtained in the follow-up method confined to any one form of handicap; for instance, blind men used in one wood working plant have led to a large amount of employment of not only blind, but other badly handicapped people over a wide range of the wood working industry, and this movement is still going on today.

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[illegible] several agencies in the field are trying to obtain
[illegible] the goods.

There are many different methods of indexing your classification when once it has been arrived at. The first, perhaps, that most people are acquainted with is the Dewey Decimal System. In this system each main division of a classification receives a number, and each division beneath this receives some decimal following this number to indicate that it is part of the first number and represents the division with that number. Further divisions within each of the main divisions are made up by carrying decimals on out as far as it is necessary to go. The Dewey Decimal System applies to such forms of classification as library systems and other similar forms where the means of checking up are comparatively easy and where a slight error will not in any way interfere with the working of the system. The danger of the Dewey Decimal System comes in that the party who makes the classification may make an error, and the error will not be caught until some time in the future, with the natural result that it is caught too late for the party who wishes to make use of the system.

Another scheme of classification is the letter scheme where each main division is given a letter, and the subtopics are indexed by letters beneath this main division. The main difficulty with this scheme is the lack of letters in the alphabet, and the fact that it is open to the same objections as the Dewey Decimal System in the matter of detecting errors.

Another scheme is the straight number scheme, where all the subjects are put down in a line, and given numbers in a series. Then every subject has a range of numbers which belongs especially to it. The main difficulty with this system, if it can be called a system, is that it taxes the memory enormously and is more open to error than any other scheme that has been worked out.

Perhaps one of the best systems which has developed for indexing work of this kind is the Mnemonic System, which practically alternates the letters and the numbers by columns. According to this system, the first classification may be given a letter or number, depending upon its nature. The second classification will be given a number, the third a letter, etc. until the final classification is reached. The advantage of the Mnemonic system is that it automatically

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checks up the omission of any classification, since if the letters and the figures do not alternate, within certain limits, the eye is attracted at once to the error that has been made. Furthermore, it is capable of indefinite expansion, and is almost self-translating. In making up the code letters, the letter used should always be either the first letter of the classification heading or the letter which represents the main sound of this word. It is necessary, in many cases, to change the name of the classification until the first letter or the predominating letter will be one which fits within the allowances of the system. A full description of this method can be found in C. Bertrand's book on "Scientific Management."

The classification shown in Appendix A does not purport to be a complete classification, as it was not entirely finished, but we will welcome any suggestions which may be made and appreciate any addition to the classification of the industries, that anyone may be able to make.

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Form 4 Date----------

1. Name of Firm----------

2 Address----------

---

3. Name of General Manager, or man occupying corresponding position

---

4. Firm is listed in Thomas' Directory as ----------

5. What are the other lines in which you are engaged?----------

6----------

---

6. Do other establishments in your field operate on the same general finished products as does your firm?----------

7. If not, what is the usual combination of lines in the business?

---

8. What firms in the United States are in the same line of business as yourself? If you cannot supply this information, please give us the name of someone who can. If the space allowed is not sufficient, please place list on a separate sheet.

---

9. Name several other firms which rank high in your industry.

---

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7. If not, what is the usual combination of lines in the business?

8. Do other establishments in your field operate on the same general finished products as does your firm?

9. Where are the other lines in which you are engaged?

10. This is listed in Thomas' Directory as

10. Name the firms which you consider best equipped and organized to carry on your line of work. We are interested to discover the plants which would be most satisfactory for us to visit in order to understand the operations involved in this country.

---

11. What are the general lines of distribution of your product?

A. From raw materials to your plant----------

B. From your plant to the ultimate consumer----------

---

12. Has your industry a trade organization?----------

If so, what is it?----------

Please add any further information that might be useful to us in obtaining a suitable classification of industries along the lines of products and occupations.

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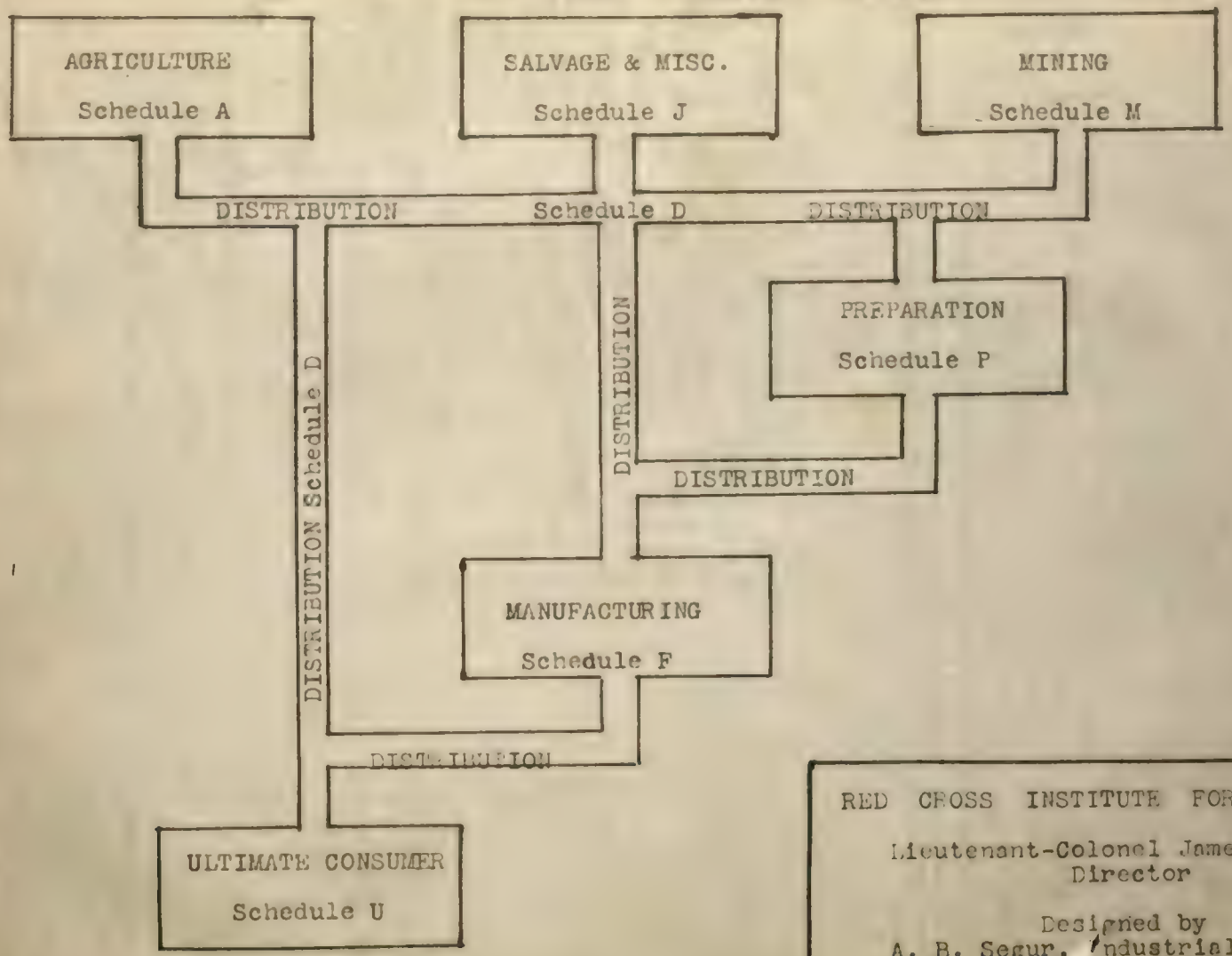
OUTLINE CLASSIFICATION OF INDUSTRIES IN THE UNITED STATES, TRACING PRODUCTS FROM SOURCE TO ULTIMATE CONSUMER



RED CROSS INSTITUTE FOR THE BLIND

Lieutenant-Colonel James Bordley
Director

Designed by
A. B. Segur, Industrial Engineer

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METHODS OF SURVEY

Selecting the Firm

When determing upon a policy to decide which firm to survey, it is well to take a number of things into consideration.

1. The size of the firm. Other things being equal, the largest firm in any one group will be the firm from which the best results can be obtained from a survey. This is not always the case since there are a number of things, such as spirit of progressiveness and similar items, which are equally important. As a general rule, however, the size of the firm is determined by more factors than simply capital. A large firm is likely to be in a more cooperative mood, in many cases, especially after the organization is sold to the use of the idea, than is the small firm. Furthermore, when the large firm has placed the recommendations into effect, the samll firms fall into line because of the success of the larger member of the trade.

2. Along with the size of the firm must be considered its reputation. A firm which for any reason has a poor reputation among the trade should not be selected for a first survey, for the reason that every other member of the trade is likely to think that this is only another example of the bad business policies of the firm surveyed; while if a firm with a first class reputation has the survey made, the remainder of the firms will swing into line on almost any recommendations that are practical because of the backing that is received from the larger firm. This is especially true in closely competitive lines.

3. The availability of the firm to large centers of distribution and large labor market should be considered. It will do but little good to survey a firm in a small town where there are no blind men, and where it would be impossible to bring in blind men. Furthermore, the housing conditions should be such that they will be favorable to the work of the blind, and transportation to the plant should be such that the blind can easily reach the plant. Your first survey is an ad for the blind, and if the blind are actually placed on the job at this plant and make a success, the remainder will be comparatively easy so far as that community and that trade are concerned. Furthermore, the firm surveyed should be thoroughly awake to the

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possibilities of the survey from their own standpoint before they are selected. The best plan is to have such a proposition that the firm is compelled to pay a portion of the cost, because, under this arrangement, unless they are interested to the point of cooperation, they will not ask to have the survey made. This item is extremely important, since if the firm does not realize the benefit of having a thorough analysis made of its various occupations with a view of finding out what the employment requirements are, the chances that the firm will follow up the survey to place the handicapped are rather remote. There is a great deal of prejudice on the part of some foremen and superintendents to be overcome at the best, and indifference on the part of the executives is the deadliest poison that has been found for killing surveys of this kind. Active opposition to the work, as carried on in some other plants is even better than indifference, because if the employer is carrying on an active opposition, he will be compelled, sooner or later, in order to justify his position, to thoroughly examine the methods used, and if he does that, the chances are that he will become an ardent supporter of the work.

The main object of all of this preliminary study before beginning the survey is that the firm may be selected in which the maximum possibilities will exist for placement between different firms. Your survey will take a long time to complete at the best. The survey of a large corporation may take many months, and it is poor policy to go into a project of this scope without being positively assured of active assistance from the beginning, and of the possibility of making the fullest use of this assistance.

THE SURVEY WITHIN THE PLANT

In beginning a survey of a plant, when once the proper plant has been determined upon, it is well to find out what the general character of the work done in the plant is, make a rapid survey of the general working conditions, the conditions of transportation to and from the plant, and of internal transportation. Form an idea as to sanitary conditions and the reasons for these conditions, and also of the welfare work and educational work that may be going on inside the plant.

Determine whether bad working conditions exist as a necessary evil in this business, or whether it is because of poor organization and poor management. Determine the general custom of the trade as to employment and as to general trade specifications in order to find out what the general requirements of the work are likely to be. For instance, in some types of work the requirements are for large output with large allowances for inaccuracy, while in other plants the requirements are for great accuracy with a small output. A change in these conditions will change your judgment, very largely, as to the ability of the blind or other handicapped people to perform the work. A general study of the policies of the firm with the officers in charge, will generally give you this data in a much better form than you will be able to obtain by studying the individual machines. It is generally a wise plant to form your own conclusions after a careful study of conditions, and not allow yourself to be swayed by prejudice or hearsay from other sources. Many otherwise valuable surveys have been greatly damaged in this way.

You must determine in the beginning whether your problem is one of job shop production or of straight line production. When making studies of straight line production, it is best to make use of the flow sheet of the material through the plant to indicate the requirements of the different jobs. The reason for this is that everyone in the plant, from the superintendent down understands what the flow sheet means, and when you index the requirements of your jobs in the flow sheet, you have shown them so that anyone can locate the job he wants to study, in very short order. Also, you have made it possible to determine very accurately what the relation of this work is to the plant.

This method is impossible in the case of job shop production and hence the organization chart is used. The boxes used, however, are the same as those used in the flow sheet.

In laying out your method of survey, the first thing to be considered is the numbering system that is to be used. In many cases, this will already be determined for you. Wherever the firm has a numbering system for occupations sufficient to cover your needs, it is wise to use the firm's scheme, rather than to try to create a new one. The foremen understand the firm's numbers as well as does everyone else in the trade, while if you put in a new scheme, no matter how simple the scheme may be, before it can be used the men will have to learn your method of numbering occupations and this is likely to be more or less difficult.

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Here is your method of numbering occupations and this simple scheme may be, before it can be used the men will have to learn your method of numbering occupations and this number, while it is put in a new column, no matter how the firm's number is changed or how many times you change your indexes, very largely, as to the ability of the girl or other employee to perform the work. A general study of the relative of the time with the officers in charge will generally give you this data in a much better form than you will be able to obtain by studying the individual machines. It is generally a wise plan to form your own conclusions after a careful study of conditions, and not allow yourself to be influenced by prejudice or hearsay from other sources. Many otherwise workable schemes have been greatly changed in this way.

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Wherever it is necessary to number the occupations, as a general rule it is best to number them in such a way that your number will tell you

1. What part of the production this position applies to.

2. The general character of the work, whether machine or bench operation or maintenance operation.

3. The routing position of this occupation in the plant, or rather, its location in the line of production.

In many cases, the firm will have numbers for their various departments which can be so indexed as to give a ready means of studying the occupations. It is sometimes possible where the firm is not so large as to compel the typewriting of the report before the survey is entirely finished, to work out one system of numbers to fit the convenience of the man making the survey, and then to make the number system conform to the scheme used in the plant. A simple code system should be worked out to indicate the general class of work that the employee is doing, so that there may be something more than the simple title of the job to give a line on what may be involved. The following example of a code is a good illustration. This is taken from the large wood working plant in which a survey is now under way.

C. Core line
V. Veneer line
G. Glue line
F. Flat line

In each case the cores are to be considered as the assembled article, since everything goes into cores, that is, since the core is the main part of the article, and the operations performed on the remainder of the parts are only performed to make them conform to the core construction. This "line" letter will always form the first letter of the code. The second letter of the code will designate the class of work upon which the man is engaged as follows:

B. Bench operations
M. Machine operations
S. Storage operations
T. Transportation operations

2. The general order of the work, whether machine or
hand operation or maintenance operation.

3. The working position of this occupation in the plant,
or rather, its location in the line of progression.

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the job to give a line on what may be involved. The following
example of a code is a good illustration. This is taken
from the large wood working plant in which a survey in some
manner was:

In all cases where you have transportation operations, place immediately following the operation number, a dash with the distance transported following the dash. The operation number is to begin with the entry of the lumber into the yeards as No. 1, and to proceed consecutively to the delivery of the finished product to the cars. Hence, operation No. GM5 would mean that this operation was the fifth operation performed on the cores, and on a machine, while GS6 would be the sixth operation with glue and would mean that the glue was being stored at this point.

The next important item to be considered in every case, is the number of men employed on a particular job to be surveyed, or being studied. The number of men where you have simple straight line production can generally be designated by a simple number such as 1, 2, 10, etc., but in cases where the men are not employed the full day on this operation, the problem of designating the number of men employed or the hours of employment is more difficult. Perhaps the best method of doing this is to make a fraction of this designation. The numbrator of the fraction represents the total number of men required to handle this operation, and the denominator, the time during the day that these men are employed. For instance, 2/.33 would mean that there were two men required to handle this operation, and that it required approximately one-third of their time during the day to handle the work on this particular part.

The question of wages is always an important one to determine when making a study of this kind, and before making a report on findings, the man in the field should first determine the general method of wage payment, whether it be hourly rate, piece rate, monthly rate, or weekly rate. When this has been determined, the heading of the chart should clearly state the general method of payment, so that there can be no question as to what is meant when the notation is made on the chart. In case the general scheme in payment is day rate, and a certain operation is paid on a piece rate, then the best method of designation is to express the payment as a fraction, the numerator of which is the amount paid, and the denominator, generally a description, the unit in which this is paid. For instance, to express the fact that a man on a certain job was earning twenty dollars per week, you would write 20/Wk.

In all of the ways you have transportation overall,
[illegible] immediately following the open-[illegible] member, a dozen
[illegible] the distance transported following the chain. The operation
tion number is to begin with the entry of the number into
the yards as No. 1, and to proceed consecutively to the
delivery of the finished product to the cars. Hence, oper-
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a man on a certain job was earning twenty dollars per week,
you would write 20/wk.

The method of designation used for setting down the requirements of the various jobs will, of course, vary with each plant. The methods used by the American Red Cross in their surveys was changed at practically every plant in some respect or another to fit local conditions.

Perhaps the most complete code as well as one of the best codes that has been worked out, was that worked out for a large automobile manufacturing concern which is as follows:

I Intelligence (Use Army classification)

A. Highest grade of executive ability

B. Capable of acquiring and using technical knowledge

C. Ordinary intelligence

D. Dull

E. All others

M Months required to learn the operation under average conditions
(Days are expressed in thirtieths of a month, thus, 4/30)

T Training and education required before beginning to learn the work

X Illiterate

R Can read and write

B Can read blue prints

C Clerical training

S Secondary technical training

U University or college technical training

A Apprentice, or a man who is just beginning to learn this particular trade.

J Journeyman, or a man who has had some particular experience in this line of work, but who has never had sufficient experience to qualify as an expert workman.

E Expert, signifies a man with many years of experience and one who has become extremely proficient in this particular line.

A Arms

R Right

L Left

2 Two, or both

1 Either one (Makes little difference which one is available)

0 None required

N Nerves

N Normal-this class precludes all nervous diseases, but does not imply exceptional nervous strength

R Reliable-where the job requires a person who shall not have any disease which prevents the full use of his brain at any time

S Shell shock-those whose nervous condition is very poor

H Hands

R Right

L Left

2 Two, or both

1 Either one (makes little difference which one is available)

0 None required

E Ears or hearing

N Normal

P Poor

D Deaf

F Number of fingers

The number of fingers required is expressed by a figure from 0 to 0 (10)

C Condition of fingers

U Unimportant or immaterial as to condition of fingers

C Clumsy, but strong

A Average

N Nimble

Analyze the next point as follows, placing symbols T,H, or K above the qualification to indicate whether it is wished to refer to T, meaning trunk organs, H, meaning heart separately, or K, Meaning kidneys and bowels separately.

T,H, or K Trunk organs

N Normal

F Fair

W Weak

L Legs

R Right

L Left

2 Two, or both

1 Either one (makes no difference which)

0 None required

R Rupture or hernia

N Normal required

H Hernia permissible

Z Size or strength of man

H Heavy

M Medium

L Light

U Unimportant as to size of man

P Pulmonary, or lungs

N Normal

P Poor

A Arrested tuberculosis

S Skin

N Normal

I Irritated

D Diseased

V Vision

N Normal

PPoor

BBlind

R Needs sight in right eye only

L Needs sight in left eye only

E Needs sight in either one (no difference which) but not in both

Following is an example of the use of the code and index:

IM TANHEFCTLRZPSV

C1C/3Ox[illegible]2D9AF2h[illegible]XH

This means that this operation can be performed by a man of ordinary intelligence, who is illiterate, and that it will require ten days for such a man to learn the operation. He must have two arms, normal nerves, two hands, may be deaf, must have nine active fingers, trunk organs may be fair, must have two legs, may have a rupture, must be of medium size, must have normal lungs, normal skin, and normal vision.

In arranging such a code, it is generally best to make up the requirements of the job as follows:

IM TANHEFCTLRZPSV	75/No
Elevator operators	
R. 154	1

Here, the requirements for the position are in the upper left hand corner, the rate paid in the upper right hand corner, the title of the position in the center, the firm's employment number at the lower left hand corner, and the no. of people employed on this particular operation in the lower right hand corner.

The following chart will give an idea as to the looks of a proceedure chart when it is finished.

In case of job shop production, where it is impossible to locate the work in such a way that one man works in one particular part of the process during the whole day, the organization chart is a better method of showing the work than the proceedure chart, and the method used is as follows:

The best method of making an organization chart in this case is to follow out the ordinary square line organization chart method, where the divisions between boxes represent lines of authority and where boxes which are together with no vertical line between signify that all the people in this section of the work are in coordinate positions. In place of the ordinary organization chart where only the title of the position and perhaps the name of the man are given, use the box form noted above. Make the organization chart with this form. The sample organization chart of the Packard Motor Car Company, Appendix G of this report, is a very good illustration.

This means that this operation can be performed by a man of ordinary intelligence, who is illiterate, and that it will require two arms, normal nerves, two hands, may be deaf, must have nine active fingers, trunk organs may be fair, must be e two legs, may have a rupture, must be of medium size, must have normal lungs, normal skin, and normal vision.

In arranging such a code, it is generally best to make up the requirements of the job as follows:

	Elevator operators
R. 184	1

Here, the requirements for the position are in the upper left hand corner, the rate paid in the upper right hand corner, the title of the position in the center, the firm's employment number at the lower left hand corner, and the no. of people employed on this particular operation in the lower right hand corner.

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In doing field work of this sort, it is generally best to deal directly with the foreman who is responsible for the output on this particular job. It is well to remember that in making surveys, you are carrying on propaganda work at the same time, to bring about the adoption of the ideas that you may evolve. Unless the foreman cooperates with you, no amount of pressure from above and no amount of ability on the part of the man that you place will be of the slightest benefit. As a general rule, the foremen are suspicious of any piece of study with which they have nothing to do, and the question of selling the idea is always a serious one. If you can have the foreman go with you through the plant, and discover for himself what the blind man or otherwise handicapped man can do, you will have made a convert to the possibilities of the unfortunate, while if you go ahead without consulting the foreman, you will have him more or less set against your ideas and will have a harder job in getting him to adopt the recommendations you may have made.

It is generally well to find out at the start what your foreman is mainly interested in. If he is interested only in himself, regardless of the interests of the company, then your argument to begin with is that he can advance himself by thoroughly understanding your type of work. If he has the interest of the company at heart, then your line of argument is that the blind men will help solve the labor problem. There is always the possibility of a great deal of sentiment in work of this kind, if properly used, that is, if it is brought in as incidental to the remainder of the work. For instance, if you can call the attention of the foreman to the plight that he would be in tomorrow or next day if his eyes should be knocked out or his legs cut off due to the feeling on the part of employers generally, that no handicapped man can work, you have appealed to him on the side which will appeal to every man who works with his hands, and if you can lead him to see that your work will simply make less disasterous a condition of this kind if it should occur to him at some time in the future, you can count on that man's earnest cooperation throughout your whole work. At the same time, it is necessary to impress upon the foreman that it is no kindness to place a man in a job that he cannot fill well, and that you want the full requirements of every job. It is sometimes possible by talking to the foreman in this way to get him to convert the superintendent and the general managers of the plant to the same point of view. There is a personal problem involved in both cases, but the personal interest is different with both, and the foreman, when he appeals to the superintendent, appeals to a line of thought that probably does not at all appeal to the foreman.

When studying the individual job, it is well to ask the foreman the full nature and requirements of the product turned out. Ask him to give the hardest conditions ever imposed on that particular job. Ask him the question as to whether the man must repair his own machine, whether it is necessary for him to go to the stock room and get his own products. (It is well to remember that where it is necessary for an operator to go to the stock bin to get his own material, or to deliver finished products to the stock bin, that there is something wrong with the organization of the department) Ask questions that lead around to the various disabilities that an efficient workman might have suffered, and questions that will enable you to answer the question, for yourself as to whether a handicapped man of any kind could work. For instance, if you see an operation you think a blind man could handle, ask the foreman whether it is ever necessary for the man to inspect his own product for blemishes; whether it is necessary for the man to go beyond a certain degree of accuracy; whether it is necessary for the man to get around dangerous machinery; whether it is necessary for the man to handle a number of other difficult operations which it might be impossible for a blind man to handle. Then, when he gets through answering your questions, and has answered them in such a way that you think a blind man could do the work, ask him the question as to why a man needs eyes if that is the case, or suddenly discover that if this is true a man hardly needs his eyes, does he? Once the foreman sees the point, he is likely to become a ready apostle of your program. The same sort of argument applies to the remainder of the handicaps. If your foreman finally sees the idea of employing men to perform a certain number of hours a day, it will make possible a permanent study of your plan in that department, and take care of your problem long after you have left it, and perhaps forgotten this particular firm.

When working in the plant, you will have to think in technicalities, of course. But never attempt technicalities on the man that is on the job, unless the technicalities happen to be those with which you are certain he is very familiar. The only effect of using technicalities which are beyond the men to whom you are talking is to arouse his disgust and to make him think that your work is too involved and to technical for the ordinary man to follow. If the technicalities are those which he understandes

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thoroughly and your questions indicate that you understand them, you will of course, have his lasting respect; but never make the mistake of attempting to deal with the other man's technicalities unless you thoroughly understand the technicalities yourself. Remember that the man to whom you are talking to knows just as much as you do, only his knowledge is highly specialized, and generally he is not trained to be charitable to the other fellow. The more closely you can bring the man on the job to your way of thinking, and to see the advantage of handling the work in this way, the more successful you have been as an engineer and as a survey man. In studying the operation to determine what the employment requirements are, it is well to make your study by going over the involved elements of motion very carefully, The methods of arriving at these elements of motion, and the full description of them may be found in "Applied Motion Study," by F.B. Gilbreth. In studying the motions in the light of these operations, a very careful analysis must be made to determine that you have included all of the elements.

A better description of the method of doing this will be found in a letter chapter on time study. The attached instructions giving a list of the motions, together with the portions of the body that are used in performing each and a resume of condition. to be studied in connection with each disability will be useful to the new survey man.When you have determined the parts of the body required from the standpoint of motion, you must then analyze the same operation from the standpoint of internal organs and other requirements, such as intelligence, time required to learn, and training necessary. Many of these things can be gained through a conversation with the foreman or with the superintendent on the job.

When studying the operation to determine what the requirements are, be sure to note whether there is any evidence of loss of motion, or any operation which is performed which could evidently be omitted. For instance, in many cases inspection operations are involved in processes where they are not at all required. Inspection operations of this type generally require eye sight, while if they are omitted the eyes are not required. Leaving out the inspection and centralizing it, not only gives a better quality of product, but it gives a much higher production. This is not always true, and you must be very careful when making your study to determine that you have not omitted an essential item. The code attached herewith as a "Reference List of Symbols for Classification of Jobs" is one worked out for a canning concern. Note the differences between this code

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Then study the operation to determine what the assignment
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attaining an efficient job depends upon the full application
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and that of the motor car company. These differences will occur between codes in different firms, although as a general rule the code should be kept uniform as possible. The code for the automobile company is a later code, and is based on the experience of the packing house code. If a code is started in a plant, it should remain unchanged throughout the entire survey, and for that matter, through the industry, so that there will be no confusion between different operations. After the survey has been made, and the requirements determined, it then remains to make the data available to the plant. This can be done in several ways. One of the best ways is to place the employment requirements by code on the various job cards that may be used in the plant to guide the employment department in employment, and on any other cards in which the name of the occupation may appear and in which the card is in general use. The chart itself forms a very useful method of following the data up, since, if a man appears at the door with only one arm, and is normal in every other respect, it is very easy to follow down the line of the chart until a position is found that requires but one arm, and then determine whether the position is one that fits this man's training. Other schemes of elimination are generally possible before you come to this point. For instance, if a man is a foreigner and has been injured and there is considerable jealousy between departments about foreign and domestic labor, then the first elimination is to eliminate all departments in which a foreigner could not work, and then to find the position in the departments which remain that require but one arm, or no eyes, or whatever the handicap in the case may be. As a general rule, this is a very simple operation, and can be performed in a very short time. Where this is impossible, the next best plan is to make use of some scheme of automatic filing, such as the Findex Card System. This system consists of a series of cards having holes punched every half inch in both directions. Generally there are ten holes in a row, and the variations in the cards run from six lines to ten lines. The cards fit in a case which is so built that the front of the case has holes which match the punch holes in the cards. It is so built that the cards when standing on edge, match the holes in the front of the case exactly. If it is desired to designate that one of the items is taken care of in this classification, the space between the holes is punched out with a special punch, leaving a slot in the card. When it is desired to determine, for instance, what positions in the plant are open to the blind, you would simply take a wire rod which fits the holes and punch the card in the place of the box. Drive a wire through the hole in the front of the box which

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stands for blind through to the end of the box; turn the box upside down and all the cards for the positions which could be filled by the blind will drop out about half an inch. Then place the wire through the slot in the top of the cards which fell, turn the box right side up, and the desired cards will remain above the rest of the cards in the box. Then read the date on each one of the cards that have fallen out, and you will find the position for your blind man quickly.

There have been a number of card systems arranged for the use of employment offices, some of which are very good, but the main utility of these for the purposes of using the handicapped, is simply that the employment requirements can be placed on the card system.

The attached blue prints were worked out for a set of job analysis cards by a motor car company for the use of their interviewers. They desired to arrange the data on Rand cards so that the interviewer might be able to refer to the job requirements instantly. For this purpose, the cards show on the succeeding blue pages were used.

The main advantage of such a survey and the only use for the expenditure of this amount of money so far as the handicapped are concerned is the fact that it permits of automatic placement. It is not necessary to make a study of the entire shop every time a man comes in who is handicapped in some way or another. The experience in one part of a shop can be made of standard benefit throughout the shop, and even in case the men placed are not handicapped, it is possible to so arrange the work that men who are especially good at one type of work may be placed on that type of work for which they are best fitted.

The utility of this class of survey of employment problems and for performing a great number of services at the same time is best illustrated by an illustration from one large rubber concern in the country. A young Lieutenant who had been an assistant superintendent in his company for a number of years previous to his enlistment was blinded in the Argonne forest. When he returned the company was very anxious to find a position that the man could fill to the best advantage. The only position that the officials of the company were able to figure out was a position on which the young man had been employed before going into the service.

strands for piling through to the end of the box; turn the box upside down and all the cards for the positions which could be filled by the filled cards will fall out. Then place the wire through the slot in the top of the cards which fell, turn the box right side up, and the desired cards will remain above the rest of the cards in the box. Then feed the cards on each one of the cards that have fallen out, and you will find the position for your piling men quickly.

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Job analysis cards by a motor car company for the use of their interviewers. They desired to arrange the data on hand cards so that the interviewer might be able to refer to the job requirements instantly. For this purpose, the cards show on the succeeding nine pages were used.

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ability of the applicant to do the work, the only position that the

This position required a great deal of clerical work, and to open a job that this man could fill required that part of the duties of six men be given to one man, and that this one man be provided with a secretary in order to carry on his work. The idea of the company was to find a position for this man, and they were willing to go to almost any length to do so. The American Red Cross undertook a survey in this plant at the request of the company. As a result of the survey, it was discovered that in one of the company's departments, there were a large number of operations which were open to the blind, that one division was just opening, and that there was a large labor turnover in this particular department. It was suggested that the Lieutenant, who happened to be a man of considerable executive ability, be placed in this department and taught one of the operations. As he learned this operation so that he was able to get the same production as the sighted man, he was to be transferred to a second operation and taught that. Then, he was to be permitted to drop back to his first job and train a second blind man to fill that, and then to train another blind man to fill the second job, etc. , until the company would be able to employ all the blind which were available in that section of the country, under the supervision of a blind officer of the Army.

This same company maintains the largest industrial deaf colony in the United States, and has had excellent success by the same method. This one discovery made possible the employment of the young blind officer in a position which had far more future than the first position because it prevented temporary disorganization of one department, and made possible a new labor supply for this company in a place which had been hard to keep labor. But this was not all. A number of the occupations which this company had were dangerous occupations and although the company has one of the best safety departments in the country, still there are a large number of accidents in the course of a month. The problem has continually arisen as to what was to be done for the men who were injured in the company's employ. The company had long taken the policy of giving employment to every man injured in the company's employ, and carried on this policy consistently for a number of years, but the main difficulty was that the men were not placed in positions where they could earn their maximum income.

section of the country, under the supervision of a blind officer of the Army.

It was nearly always necessary for the man to take the position which paid a smaller salary than the position which he had left, the result being, of course, that the man was more or less dissatisfied with the treatment he had received as he looked at it, and the company was losing his skill on their production chain, because in all cases the new position which he took was one which required less skill, and required but very little of the knowledge he had spent years in acquiring. As a result of the surveys, it was possible for this company to find positions for practically each of their handicapped men where he could earn an amount as great, if not greater, than the amount he had been earning up to the time when he was injured, and also to place him in a position where the knowledge that he had acquired previous to being injured was useful to the company. The company now proposes to use the same data to employ soldiers who are asking for employment in the company, and after that, to adopt the policy of employing handicapped civilians. Inasmuch as this particular company is located in a city where, because of housing conditions, it is almost impossible to get an adequate labor supply, the benefit to the company through being able to make use of labor already on the ground will be at once apparent.

Another case in which this data has been of immense value is found in a large mail order house. A preliminary study was made of the small mail order house, and it was found that the stenographers who worked in this particular office could be blind. The Red Cross employed blind stenographers in their industrial office and after they had thoroughly established the possibility of the blind operator reaching production on this class of work, went to the head of one of the largest mail order houses in the country and laid before him the possibility of getting good stenographic help by making use of the blind. Today, this company presents a standing offer to accept any blind stenographer who is able to reach the company's standard of speed and accuracy. Already several stenographers have been placed in this firm and the work is still going on.

A survey was made of the occupations in a large packing house to determine whether there were occupations open for the blinded soldiers. After the survey was about two thirds complete,

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it was discovered that there were no men at the school for the blind at Baltimore who were wanting to gain employment in the packing houses, but the Federal Board of Vocational Education received permission to place over two hundred handicapped people on the regular production chain of this concern, while the previous standards for employment have always been that a man to work in these places should be physically sound, and there were but very few positions in the firm which had been filled by the handicapped.

Appendix J shows a few blind people who are now working and earning a living wage on jobs previously closed to the blind under the same circumstances, due to the findings of surveys of this kind. The possibilities of the surveys that have already been made have not even been touched upon. It is safe to say that with the proper follow-up, these surveys could be made the basis for the employment of almost every handicapped person in the United States who had the right attitude toward the firm and who was mentally competent. Agencies interested in the employment of the blind or the employment of other handicapped people, should get in touch with the firms in their cities or towns who are employing labor, call their attention to the survey made, and determine whether any of the same conditions which exist in the firms surveyed exist in their own firms and whether there is not a great possibility for the employment of handicapped people in their sections.

A large firm engaged in manufacturing office appliances was working out a reorganization of their manufacturing department, when the general manager heard of the surveys being undertaken by the Red Cross. He asked that a survey be made in his plant. He appointed the man who, under him, had charge of the reorganization work in the firm, to make the study. This man studied the method of work under the engineer of the American Red Cross and in turn appointed his first assistant as the man to take care of the detail work. The result was that a Board was formed on employment problems which is probably one of the strongest boards on employment in any place in the country, and already the company has discovered how to place the handicapped in their own plant to the very best advantage, and has made arrangements to change the occupations of several

of them. It has also discovered opportunities for saving cost in production which will pay for the cost of the survey to the plant many times over. This corporation is about to enter into a large program of handicapped employment in one of the large industrial centers which will make it eventually one of the best in the entire country. From the standpoint of the company, the surveys are of little use unless they are consistently followed up, and every effort should be made to take care of the follow-up work as the surveys are completed.

Some active placement work has been taken care of by the Detroit Community Union in Detroit, Michigan, and an illustration other than the practical side of this problem is showing itself there. Men who used to sit on street corners and beg for a living have gone to work in the Detroit factories, and they are wearing their identification badges on the outside of their clothes to signify that they are now honest work men, instead of street beggars. In other words, the tin badge, instead of being the mark of servitude has now become the badge of victory over the tin cup. What greater argument could there be for consistent survey work?

As an example of what can be done by placements from one industry to another, an illustration from the wood working field will be valuable. A large chair concern gave employment to two blind men, one of whom proved successful, and the other of whom did not. The successful man had been with the chair firm for about five months and the experiment was being watched by a number of other men in the same trade. A competing house was needing labor, and learned about the blind man being employed in the first firm, and as a result put on three blind men in their own plant, thereby helping their own production and forming an outlet for the blind. The first firm, after seeing the success of the blind, hit upon the idea of using the other handicapped people as well, and as a result, the firm now pursues the policy of employing people with all kinds of handicaps on different processes in their shop, allowing those who are unable to work the full number of hours to work for a shorter number of hours at the hourly pay that they would receive had they worked the full time, with the result that the first firm has greatly increased its labor supply, and has rendered a benefit to humanity as well.

An electrical appliance house employed two blind men on processes which had previously been brought out in a Red Cross

survey of the plant. The men turned out exceedingly well, one man being what was known as a "speed artist." A second electrical plant, seeing the results in the first firm took the matter up with the union which was in their plant to determine whether the union would permit the employment of blind and otherwise handicapped men in their plant. As a result one blind man has been employed and has been admitted to the union. The work of placement is still going on.

The possibilities for the blind in industry are only just being uncovered. The United States is being called on for a production which is unprecedented in history. We have switched from a debtor nation to a creditor nation and are one of the very few nations who have had our industries untouched by the war. The European countries must receive their machinery and supplies from the United States in order to carry on their reconstruction work. Furthermore, the European countries which formerly financed South America and Asia and Africa to their purchases are no longer able to carry on this financing. It will now be necessary for these countries to appeal to the United States if they are to carry on this financing. It will now be necessary for these countries to appeal to the U. S. if they are to carry on their business on the basis on which it has been carried on in the past. It has been said that there are over one million applications for passports in Washington at the present time. At the same time, there is practically no immigration into this country from Europe, and hence, we are facing a labor shortage brought on by a depletion of the labor supply which has formerly been made up by Europe, and by great manufacturing prosperity. If the manufacturers of the country are to produce up to their demand, they must have labor. The supply of able bodied men has largely disappeared, and practically the only source of supply now left is the handicapped and those who have previously been considered unfit for production. Now is the time for the social and industrial agencies of the country to come together on a common program for the benefit of all. We will then be able to meet our emergency by the proper use of our human resources as well as by the proper use of our material.

At the same time, the war has brought on in this country a larger realization by a large group of people of their social responsibilities, and instead of the cold feeling of four years ago toward humanity in general, the average employer has a warm feeling toward his fellowman. The social agencies have always been

engaged in work of this kind, and have placed the benefits to the man needing help above every other consideration. The time has now come when the social agencies and the employment agencies can get together by adopting a common standard for employment and for employees. The social agency in the past has been particularly interested in finding a job for the man where he would be able to earn a day's pay, and in many cases tried to find the position regardless of whether the man earned the pay or not. The employer, on the other hand, has been particularly interested in what the man could produce, and in most cases has not tried very hard to determine whether a handicapped man could turn out this product or not. With new standards being set which will bring both to a common understanding, the future for the handicapped men of all ages should be exceedingly bright. The time is not far distant when the world will look back with horror on the previous years when the man who had been handicapped through some accident in industry, or through an accident of nature, was unable to get a position, and was compelled to depend upon the sympathy of his fellow men rather than upon the ability of his own hands and his own brain. There will be many blunders before this is completed, but when it is brought about, we will then have entered a new social day.

MOTION STUDY

Use of the MOTION PICTURE CAMERA

As the surveys progress in the plants, many operations appear which have a wide range of use and are highly repetitive, but the man making the survey is not certain as to their adaptability to the blind. On the other hand, many operations will be found in which there are many thousands of people employed in the country. In either of these cases the motion picture camera can be used to a big advantage.

In order to understand the methods employed in handling different types of motion studies, it is necessary to have a thorough understanding of the following:

1. The technique of motions for educational purposes. Unless especially trained, workmen are seldom skilled in the best method of performing any operation. It generally takes a long time to determine the best method, and once this method has been determined, it is very important that it be preserved and reduced to standard practice. Operations consist of a series of motions, and unless the motions are studied in detail, the operation cannot be taught th the new man. This is especially true in the case of the handicapped, since he must be taught to perform the operation without the missing faculty.

2. The working elements of motion. A careful study of almost any series of motions will show methods of shortening operations by

A. Eliminating non-essential motions,

B. shortening the essential motions,

C. so changing the order of the motion in the operation that certain operations will become unnecessary and will be eliminated. It sometimes becomes possible to eliminate parts of a motion which require faculties not possessed by a handicapped man by

a. substituting a simple contrivance for the lost sense or faculty, such as making use of a swivel chair for a legless man.

b. so changing the operation that the use of the lost faculty is not required.

c. substituting machine operations for hand operations.

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3. The essentials of machine design. It is a very safe maxim that any operation which does not involve the use of the motions knows as "search,""find,""select," and "inspect," can be reduced to machine operations. In many cases, operations which involve these four motions can be reduced to machine operations by changing the method of handling. In many cases, it is possible to discover the essential action of a machine by a careful study of the motions of the hands, remembering in all cases that it is the result and not the method that is required in the end.

4. The value of motion studies as a method of determining fair piece rate. It is impossible to determine what the proper piece rate for performing a unit of work is without a careful study of the detail motions of the operation. Once the data as to the proper time for each motion of the operation is available it is possible to determine quite accurately the correct piece rate for the operation by the process of synthesizing motions.

METHOD OF STUDYING OPERATIONS

The method to be used in studying any operation is determined entirely by the amount of work involved. In studying any operation or series of operations, consider first the very largest possible unit in the plant. The over-all operations of the plant must be studied to determine

1. whether it is possible to eliminate certain operations entirely.

2. whether it is possible to segregate operations of one type so that they may be all performed at one place more economically.

3. whether operations can be so planned as to place related operations together.

When once the general plan of operations has been evolved, the individual operations may be studied in three different ways:

1. In case the operation does not require the full time of one employee, examine the operation carefully in the light of the sixteen elements of motion, and determine which can be eliminated, and how.

2. Where the operation requires the full time of from one to four men it should be studied by writing down each individual motion, eliminating motions where possible, and then timing the revised list of motions with a stop watch from twenty to one hundred or more times. The individual motions can thus be studied in the light of the stop watch reading and shortened or eliminated wherever possible. The motions can then be synthesized in the operation and the proper cost accurately determined.

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3. Where the operation is highly repetitive, and where it is possible to make a large saving in dollars on the operation in any single plant, the operation should be studied by a careful visual examination to determine, as nearly as possible, the best method of performance and then by means of the motion picture machine or, in other words, micromotion study.

MICROMOTION STUDIES

In making micromotion studies, it is always well to remember that there are many thousands of dollars involved when this method is used, and that the accuracy of data and permanency of records are of first i portance; and that the cost of obtaining these results is a secondary consideration. It is, therefore, well to have the best materials and the very best appartus for making such studies. Briefly, the apparatus involved in making micromotion studies is as follows:

1. A motion picture studio, or surroundings equal to a motion picture studio,

2. Changing room,

3. Light,

4, Electric current,

5. Motion picture camera,

6. Motion picture films, or raw stock,

7. Tripod and bench for camera

8. Screens

9. Sign painter's apparatus

10. Clock

12. Stereoscopic camera

13, Dictating machine, and

14. Necessary apparatus for performing the operation.

The personnel required is as follows:

1. A good director,

2. Expert operator to perform the work being studied, who is known as the "star"

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2. Dressing room.

3. Light.

6. Motion picture film, or raw stock.

7. Tripod and bench for camera

8. Screens

10. Clock

12. Microscopic camera

14. Necessary apparatus for performing the operation.

The personnel required is as follows:

1. A good director.

2. Expert operator to perform the work being studied, who

3. A good camera man,

4. A good electrician,

5. A good sign painter

6. A good attendant to watch the scene numbers

We will take up these requirements one by one.

Apparatus

1. Motion Picture Studio

The studio is an important factor, since the cost of making motion pictures is so great and the results to be obtained by the use of proper surroundings are so much greater than the results to be secured in poor surroundings. The motion picutre studio should be at least ten feet wide by twenty-five feet long, and should be fitted with several banks of mercury vapor lights over head, which can be turned on or off at will. A very good substitute for a studio is a room with a skylight, and with windows admitting the light from the South West. It sometimes becomes impossible to remove the operation to a studio. In such cases, it is wise to get studio conditions so far as possible in the plant. This can be done by properly illuminating the space in the shop around the operation involved. This should not be done, however except when absolutely necessary, since the curiosity around the shop cannot be other than detrimental to shop discipline.

2 Changing Room

In changing from one film to another, a dark room should always be provided. It is possible to do this work inside of a black cloth bag, but the operation is always very slow and laborious, and is not to be recommended, except where absolutely necessary.

3. Light

It sometimes occurs that the internal lighting in the studio is not sufficient to give the proper illumination, and outside lighting must be provided. Very good lights for this purpose are known as the Kleigel lights. These are open arc lights, having the reflector at the back and sides, so that the light may be thrown in practically a straight line. When using these lights, it is very important that the "Star" be warned not to gaze at the light any length of time, since these lights will cause electric ophthalmia. The mercury vapor light is very good for overhead lighting, but due to the fact that that tubes are more or less fragile and cannot be moved from place to place, they are hardly adaptable except as local lights. When lights are not available to handle the operation, the same result can sometimes be obtained in a way by painting all of the important parts of the machine white, and then taking the picture under regular factory conditions. The only difficulty with this is that one is never certain when the picture is being taken, just what part of the action is going to be necessary in making the final study.

1. A good camera man.

4. A good electrician.

5. A good attendant to watch the scene numbers

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1. Motion Picture Studio

The studio is an important factor, since the cost of making motion pictures is so great and the results to be obtained by the use of proper surroundings are so much greater than the results to be secured in poor surroundings. The motion picture studio should be at least ten feet wide by seventy-five feet long, and should be fitted with several banks of mercury vapor lights over head, which can be turned on or off at will. A very good substitute for a studio is a room with a skylight, and with windows admitting the light from the South West. It sometimes becomes impossible to remove the operation to a studio. In such cases, it is wise to get studio conditions so far as possible in the plant. This can be done by properly illuminating the space in the shop around the operation involved. This should not be done, however except when absolutely necessary, since the curiosity around the shop cannot be other than detrimental to shop discipline.

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4. Current

To serve the light where a special motion picture studio is not provided requires about 75 amperes and 220 volts, or 150 amperes and 110 volts, or even more, depending upon the size of the object which must be photographed.

5. Camera

There are several good cameras on the market for t king motion pictures. The very best, as well as the most expensive is probably the Bell Howell camera. This may be used where all the surroundings are ideal. There is, however, a hand made camera known as the U.S. compact, which may be purchased from the Bass Camera Company of Chicago. Other cameras which are very satisfactory for the purpose are: Pathe, manufactured in New York City, the Universal Camera sold by Burke and James Co., Chicago; and the Schusek Camera, manufactured in Chicago.

6. Motion Picture Films

No day's work should be begun without at least four or five thousand feet of motion picture negatives on hand or easily accessible. All magazines should be kept loaded, so that in case of long action, no great time need be lost in changing films. The amount of film used is always considerable in this class of work.

7. Tripod and Benches for Camera

In handling the motion picture camera it is always wise to have on hand a chair, one large table, and two or three small tables with unfinished tops or two or three small platforms which can be moved around at will, so that the camera may be set on top of the benches in order to take the pictur s close up or over the head of the operator.

8. Screens

In order to measure the length of the motion, screens must be pl ced at the back of the operator and on the floor. The vertical screen must be placed at the back, as close to the operator's side as is convenient for rapid work. The horizontal screen must be placed under the feet of the operator and must show in the picture wherever the length of the movement is a deciding factor. The best screens for this work are those shown herewith as Figure 1. One of these screens should have black lines on a gray or white or yellowish background, and the other should have white lines on a black background. The black background should be used for the floor, the white b ckground for the vertical screen. These should be marked in four inch squares with heavy lines

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indicating the divisions. When measuring the lengths of motions in the film, this will facilitate determining the exact lengths, by interpolation of distance shown on the screen. Other types of screens can be used, but the possibility of moving the screen and its adaptability to being moved from place to place must always be considered, and it is believed that the type of screen shown will be cheaper in the long run. Where the permanent micromotion study laboratory is established, it is possible to have permanent screens on the wall and on the floor by simply painting the proper divisions. In all cases, the material used must not reflect the light.

9. Sign Painter's Apparatus

There should be on hand a sign painter's table or bench, a full supply of sign painter's pens, India ink, gray card board in pieces of si es 2½ by 12 inches, 2½ by 18 inches, 2½ by 24 inches, and 5 by 24 inches. About twenty-five pieces of each size of this card board will be required for each day's photographing.

10. Scene Numbers

Scene numbers can be provided by the use of calendar pads of different sizes. Figures should always be of such size that they will appear on the film from one to two percent as high as the picture. The numbers from calendars should be white figures on a black field. It is always wise to select sheets of different size letters from calendars to select sheets of different size letters from calendars of this sort. The numbers can be cut out of the calendars with sissors and fastened together by means of paper clips.

11. Clocks

The clocks for making these pictures are the most important feature of the entire apparatus. The only suitable clock on the market is the one handled by Mr. F.B. Gilbreth of Providence, Rhode Island. In each picture there must be at least two clocks:

A. The micromotion clock, the hand of which revolves at twenty revolutions per minute. The dial of the clock is divided into one hundred divisions, so that each division of the clock is one two-thousandth of a minute. The clock has no escapement and therefore the reading is accurate at all times. This clock is a very delicate piece of mechanism, and in moving it around from place to place, it should be carefully packed. It should never be entrusted to express companies unless packed in an especially padded trunk.

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Signs

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B. A one minute clock, about the size of an alarm clock, which has but one hand revolving around the face once per minute. This clock has no escapement, and consequently the reading is accurate to the hundredth part of a minute, and by interpolation, the readings can be made to the thousandth part of a minute. This clock is encased in an alarm clock case.

When it is necessary to photograph over a large amount of time, or when it is necessary to leave off photographing for any length of time, due to changing the operation, the ordinary alarm clock, from which the glass has been removed is also placed in the picture. These three clocks should be very carefully regulated, so that each one is running accurately. The picture must always show whether two clocks or three clocks are used.

12. Stereoscopic Camera

In reading films, and in making machine designs, it is frequently necessary to have an accurate idea of the conditions in all dimensions which existed at the time. This can only be gained by means of a stereoscopic photograph of the set. This picture is not always necessary while the film is being read, but it is impossible to tell just when the necessity is likely to arise. The camera should always be on hand and one picture should be taken of every set, and properly identified on the note book.

13. Dictating Machine

In making every motion study important enough to require the use of a motion picture machine, important items are constantly arising and ideas occurring to the director and others. In order to have a complete record later on as to the peculiar features of the operation and surroundings, these ideas should be placed in permanent form immediately, to be transcribed later and used with the motion picture films while they are being read. For this purpose, possibly the best apparatus is the Edison dictating machine, with a liberal supply of shaved records. In dictating to the machine, it is always important that the name of the operator, the date, and the reasons for dictating the items be included in the dictation to give a complete index to the portion of the film concerned.

14. Necessary Apparatus for Performing the Operation

Needless to say, it is impossible for a workman to do his best unless the conditions existing in the factory are duplicated in the studio. This sometimes seems to take a considerable expense, but in an operation which is to be studied with the motion picture, the cost is not to be compared with the benefits to be gained. The machine or apparatus should be set up in the studio exactly the same as they appear in the factory, so far as possible, unless it has been found by previous experiments that some better method already exists for performing this operation. In this case,

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Personnel

1. A Good Director

The director of the scene must be a first class engineer, who thoroughly understands the whole purpose of the work. The director shall, at all times, have control of the work, and shall give all orders to the "Star" camera men, and others connected with the scene. The director is responsible for the final outcome of the picture.

2. Expert Workman or Operator

One of the purposes of motion picture study is to determine the best way in doing a piece of work. Therefore, the operator who works in the scene, or in other words, the star should be the best operator in the plant for this class of work. In addition, the operator should be given a small incentive for doing the operation in the very best way that is known. Sometimes a piece of the film which has been made of a short operation is sufficient to get the very best work done, especially if the operator happens to be girl or a woman.

3. A good Camera Man

The camera man can either make the picture a decided success from the standpoint of photography or he can make the picture almost unreadable, depending upon his ability and attention. It is, therfore, necessary that a first class camera man be provided, and that he give his undivided attention to the production of a good picture. It is well to impress upon him, when taking a picture, that it is detail that is wanted, not artistic beauty.

4. A Good Electrician

When taking motion pictures, it is very important that the lights should be set so as to get the best illumination at all times. In order to do this, the man is required to thoroughly understand illumination and electrical connections. He should be a man of experience with motion picture concerns. A safe rule is that a good electrician is one who gets the light where it is wanted and keeps himself out of the way, or who is never noticed in the set.

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5. A Good Sign Painter

A sign painter must be provided who is an expert on bold Gothic lettering. In doing this work, both speed and neatness are prime requisites. Where there is a great deal of this work to be done, it will pay to have two sign painters on the job, since one may not be able to letter the signs rapidly enough. It is well to study the work ahead at all times so that a list of signs may be given him to make up in advance while the scene is going on. There are very few sign painters who are able to do this work well, and the rate for this class of work is from one dollar to one dollar and fifty cents per hour. Do not attempt to use second rate sign painters.

6. A Good Attendant to Watch Scene Numbers

The scenes that appear in the picture, and the scene numbers are of extreme importance when matching up the negatives and when reading the film. One person should make it his business to see that the scenes are properly placed, and that the scene numbers are put in the pictures and changed often enough to clearly show the different divisions of the film. The most common error made in scene numbering is in not putting in enough numbers. If the attendant thoroughly understands the work, he or she need not be a first class engineer, but should be someone who is endeavoring to learn motion picture study, and who, therefore, has a great deal of interest in doing the job well.

General Instructions

To be photographed, machines must always be so placed that they can be illuminated without light shining into the camera. One screen must be hung vertically so that each picture will show the star and the apparatus in front of the vertical screen. It is generally best to use the screen with the black lines on the light background for a vertical screen, since this gives the maximum illumination. The horizontal screen must be placed on the floor at right angles to the vertical screen in such a way that the lines on the two screens match. When the screens have been placed, the apparatus upon which the star works should be placed as near as possible in the angle formed by the two screens and near the center of the screen. The light should be placed immediately outside the range of the camera in such a way that it will illuminate the center of attention in the picture. All other apparatus, such as dictating machine, sign painter's bench, etc. should be out of the picture entirely.

The camera must be set as near to the apparatus as possible to take in all the desired motions. It is generally well to take the picture first from a sufficient distance to cover the entire apparatus, and second, close up, showing the details as required. The camera can be raised or lowered into position either by means of a tripod, or by means of a bench which has been provided. The camera man must watch his illumination, his film, and his focus at all times.

5. A Good Sign Painter

A sign painter must be provided who is an expert on bold gothic lettering. In doing this work, both speed and neatness are prime requisites. Where there is a great deal of this work to be done, it will pay to have two sign painters on the job, since one may not be able to letter the signs rapidly enough. It is well to study the work ahead at all times so that a list of signs may be given him to make up in advance while the scene is going on. There are very few sign painters who are able to do this work well, and the rate for this class of work is from one dollar to one dollar and fifty cents per hour. Do not attempt to use second rate sign painters.

6. A Good Attendant to Watch Scene Numbers

The scenes that appear in the picture, and the scene numbers are of extreme importance when matching up the negatives and when reading the film. One person should make it his business to see that the scenes are properly placed, and that the scene numbers are put in the pictures and changed often enough to clearly show the different divisions of the film. The most common error made in scene numbering is in not putting in enough numbers. If the attendant thoroughly understands the work, he or she need not be a first class engineer. But should be someone who is endeavoring to learn motion picture study, and who, therefore, has a great deal of interest in doing the job well.

General Instructions

The photographed, meanings must always be so placed that they can be illuminated without light shining into the camera. The screen must be hung vertically so that each picture will show the star and the apparatus in front of the vertical screen. It is generally best to use the screen with the black lines on the light background for a vertical screen, since this gives the maximum illumination. The horizontal screen must be placed on the floor at right angles to the vertical screen in such a way that the lines on the two screens match. When the screens have been placed, the apparatus upon which the star works should be placed as near as possible in the angle formed by the two screens and near the center of the screen. The light should be placed immediately outside the range of the camera in such a way that it will illuminate the center of attention in the picture. All other apparatus, such as dictating machine, sign painter's bench, etc. should be out of the picture entirely.

The camera must be set as near to the apparatus as possible to take in all the desired motions. It is generally well to take the picture first from a sufficient distance to cover the entire apparatus, and second, close up, showing the details as required. The camera can be raised or lowered into position either by means of a tripod, or by means of a bench which has been provided. The camera man must watch his illumination, his film, and his focus at all times.

It is well to remember in taking micromotion picture studies that the camera must be so focused as to show the maximum detail at the center of attention. The center of attention is generally the vital point of the operation; for instance, in assembling a gasoline engine, the center of attention will be the bench on which the parts are being assembled. We are not particular about the looks of the picture, and if it suits the purpose of the study, the head of the star may be entirely cut off.

One of the most important things to be taken into consideration in taking micromotion picture studies is the signs. Signs are placed in the picture while the operator is working, or in case preliminary signs are required, they are either fastened to the frame work of the apparatus and left there during the entire scene, or placed in the scene, one at a time, until the preliminary signs have been used. Explanation signs are alway placed in the picture while the operation is being performed. The signs must be held level, and it is a very good rule to place a small wire stand on one end of the sign while the director holds the other in his hand. When in doubt as to the amount of explanation required, the best rule is to remember that no picture was ever photographed which contained too much information. Many times an element in the operation seems to be a small and insignificant detail while the apparatus is working; but it is not at all easy for the film reader to supply the explanation of the detail from the pictures. Whenever possible, a complete list of the signs that are going to be required should be handed to the sign painter in advance. These signs should always be arranged in their proper places on the bench, so that each sign may be picked up at the right time during the set. This list should be saved and sent to the film reader. The name of the Company whose work is being photographed, the date, special data as to the surrounding weather conditions, the name of the star the name of the operation, the place where the picture is taken, and the name of the process of which the operation is a part should alwayssbe noted for every set.

Before starting work on a picture, be sure to have on hand a loose leaf note book in which to keep these notes. A convenient size is the I^P Loose Leaf Binder No. 105 with Lefax filler. Use No. 18, which consists of cross section paper with ten divisions to the inch to make a diagram of the positions of the screens, operator, camera, and other items of interest.

The best speed for taking pictures ordinarily is 16 exposures to the second. When, however, the motions are extremely rapid and it is desired to determine facts regarding the motion that cannot be learned by the use of the ordinary film, difficult parts of the action may be taken at a much greater speed. Pictures have been taken at the rate of four hundred pictures per second.

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Before starting work on a picture, be sure to have on hand a loose leaf note book in which to keep these notes. A convenient size is the 7" loose leaf Binder No. 10C with Reform filler. Use No. 13, which consists of cross section paper with ten divisions to the inch to make a diagram of the positions of the screens, operator, camera, and other items of interest.

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Care should be taken to

1. be sure that the numbers are changed often enough to make certain what each scene is and where it begins.

2. place the numbers in some spot where they can easily be seen.

3. see that the numbers are the right size to be in the picture, and yet not obscure the vital parts of the set.

When charting the action, be sure that the operator is allowed to carry through enough cycles to enable you to see just what you want in the picture, and arrange your set so as to be able to take in these items. It is well to remember that raw film stock is expensive, and when you take more pictures than are desired, you are using considerable amount of money. On the other hand, it is expensive to leave out vital actions. On short cycles, at least three complete cycles should be obtained. On longer cycles, two should be sufficient.

When starting on a new lot of films, be sure to take a test piece, one or two feet long, to determine

1. the quality of stock

2. the exposure required for taking.

3. the exposure required for developing.

Each roll of films must be enclosed in a box which is impervious to light. The smallest leakage of light will spoil an entire roll of film. The film should be sent at once to a commercial laboratory for development, or if a private laboratory is available, it should be sent there. The diagram shown as Fig. 2 ill give a very good idea of a proper arrangement for a small private laboratory.

As a general rule, the pieces of negative are mixed up considerably in the process of development. They must then be arranged in their proper order and pieced together. The piecing of negatives is not always an easy task. The best method is to arrange the pieces into piles according to scene numbers and properly label them in piles. Then start with the beginning of the scene and wind the film on a reel, fastening the proper ends together as you go.

A most convenient apparatus for matching films consists of:

1. a repaire table. This consists of a small metal table from the center of one side of which a section six in. wide by ten long has been cut and covered with ground glass. A strong mazda

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light is placed under the glass. About two feet to the right is placed anfilmtwinder and two feet to the left a reel holder. A diagram of this table is shown herewith as Fig. 3.

2. A safety razor blade.

3. Film cement.

In piecing films, proceed as follows:

1. Wind the first piece of film into a roll on the film winder.

2. Cut the last picture off squarely about one quarter of an inch from the forward end with a safety razor blade.

3. Scrape off the emulsion from the end of the adjoining picture.

4. Place a thin coating of film cement on the cleared portion which has just been scraped.

5. Cut the forward end of the next piece of film off squarely at the edge.

6. Place the end of the first picture on the second piece of film against the end of the last picture on the first piece of film taking care that the emulsion side of each piece is toward you, and that the holes in the edge of the film are matched perfectly.

7. Hole the ends together until the cement sets.

The light under the ground glass is of great value in finding the end of the picture, and in determining whether the holes of the mended portion coincide exactly. For printing purposes, negatives should be made up in four hundred feet rolls. The negatives can then be sent to the printing room, and the positives printed. When the positive is printed, it should be pieced together into one thousand feet rolls, so that the action follows in consecutive order. Use the same method for piecing the positive that was used in matching negatives.

Film Reading

In studying this kind of work, it is well to review the purpose of motion study. To facilitate reading, all motions ma be divided as follows:

1. SEARCH is the motion required in seeking an object upon which work is to be performed. Search may be with the eyes, hands, or any other part of the body, and represents the period of uncertainty as to the location of any piece of work or any tool.

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2. FIND consists of locating the piece upon which the work is to be performed and takes into consideration the time following the moment when "search" has been completed, and when "selection" or "grasp" begins.

3. SELECT is the operation of determining which piece to use in performing the work. Needless to say, these three motions should be avoided wherever possible. In most cases, they represent waste motion, and whenever they represent any considerable portion of an operation, a study should be made to ascertain whether elimination is possible. They also prevent the use of automatic machinery.

4. GRASP consists of taking hold of a piece, and holding it afterwards if that is required; for instance, the operation of holding a board while it is being sawed in two would be known as "grasp".

5. POSITION consists of changing the position of a piece with relation to the hands, fingers, or other part of the body, so that it may be ready for the next operation; after a hammer has been grasped, turning the hammer so that the small end shall be available for a riveting operation is known as "positioning" the hammer.

6. ASSEMBLE consists of placing two pieces or more together for further use; for instance, placing two halves of a core box together so that they may be filled with sand is an assembly operation as much as placing the parts of an engine together during the process of assembling the engine.

7. USE consistis of performing the actual operation connected with the tool; for instance, when a wrench has been placed on a nut, the turning of the nut with the wrench is a "use" operation of the wrench.

8. DISASSEMBLE consists of taking pieces apart which have been previously placed together; for instance, taking two halves of a core box apart after the core has been made is known as a "disassemble" operation.

9 INSPECT consists of testing a piece for defects. This testing may be in the form of visual inspection, inspection with the fingers, or in any other way.

10 TRANSPORT LOADED consists of moving a piece from one place to another.

11 PREPOSITION consists of putting a tool which has been used into position for the next operation; for instance, if a hammer has been used for riveting, and it is necessary to turn the handle in order to place the hammer in the rack, this is known as "preposition" for the next operation.

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11 REPOSITION consists of putting a tool which has been used into position for the next operation; for instance, if a hammer has been [illegible], it is [illegible] the hammer in the rack, this is known as "reposition" for the [illegible] eration.

12. RELEASE LOAD consists of motion of letting go of the piece after the operation has been performed. This applies whether it is the fingers allowing the piece to drop, or a heavy machine operation, such as dumping the earth from a drag bucket.

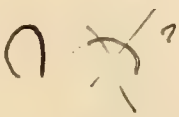
13. TRANSPORT EMPTY consists of moving the hand or some other part of the body from one position to another without the load. "Transport empty" would also apply to a dray moving from one place to another without its load.

14 AVOIDABLE DELAY consists of those delays which the operator can avoid by properly handling his work and exercising the necessary energy. In many cases, this delay consists of ordinary loafing.

15 UNAVOIDABLE DELAY refers largely to delays caused by others. It refers to those delays over which the operator has no control.

16. DELAY FOR OVERCOMING FATIGUE takes in the necessary rest period on the job.

For the purpose of writing down findings, a short hand scheme for designating the motion has been devised, in which each one of the movements has been reduced to a symbol. To facilitate charting, a color scheme has been arranged so that a synopsis of the operations can be easily read from a color chart. The following is an explanation of the code and the color scheme:

MOTION	COLOR	SYMBOL	METHOD OF REMEMBERING SYMBOL
Search	Violet		Represents the eye with the pupil in the corner
Find	Light green		Represents the eye with the pupil in the center
Select	Medium green		Represents an arrow pointing to a particular object
Grasp	Olive Green		Represents a strawberry stemmer ready to take off the stem of a berry
Position	Yellow		Represents a marble on the end of the fingers ready to place.
Assemble	Chrome Yellow		Represents four strands of cotton woven together
Disassemble	Orange		Represents the assembled fibres with one of the fibres taken away

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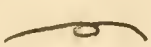
[illegible] the piece to grow, or a heavy machine [illegible] operation. This applies [illegible] [illegible] operations are [illegible]. [illegible] [illegible] [illegible]

Inspect	Light Pink		Represents a magnifying glass
Transport Loaded	Indian Red		Represents a hand carrying a ball in the palm
Preposition for next operation	Brown		Represents a bowling pin ready for the player
Release Load	Madder		Rep. the palm of a hand upside down, the ball ready to fall out.
Transport Empty	Burnt Sienna		Rep. a hand with the ball out of it
Unavoidable Delay	Cobalt		Rep. a man who has stubbed his toe and fallen face downward
Avoidable Delay	Prussian Blud		Rep. a man lying on his back asleep
Delay for Overcoming Fatigue	Black		Rep. a man sitting in a chair

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In typewriting codes, it is sometimes possible to use initials to represent these motions; for instance, the following is now being used by a large woodworking concern:

Hunt (search)	H	Assemble	A
Select	S	Disassembled	D
Transport Loaded	L	Find	F
Position	O	Grasp	G
Transport Loaded	A H L	Machine operation	
Release Load	A H F L	Machine operation Time: .003-.005	
Assemble	I A H F L W		
Disassemble	A H F		

Marking			
Delay for	Black		Rep. a man sitting in a chair
Delay Avoidable	Prussian blue		Rep. a man lying on his back asleep
Delay Unavoidable	Cobalt		Rep. a man who has mapped his toe and fallen face
Transport Empty	Burnt sienna		Rep. a hand with the palm out of it
Release load	Amber		Rep. the palm of a hand upside down, the palm ready to fall out.
Preposition for next operation	Brown		represents a bowling pin ready for the player
Transport loaded	Indian red		represents a hand carrying a part in the palm
Inspect	Light pink		represents a magnifying glass

In typewriting codes, it is sometimes possible to use initials to represent these motions; for instance, the following is now being used by a large woodworking concern:

Hand (search)	H	Assemble A
Select	S	Disassembled D
Transport loaded	T	Hold H
Position	O	Grasp G
Transport Loaded	A H T	Machine operation
[illegible]	A H T	Machine operation
[illegible]	A H T	

Transport Empty	E	Necessary or Unavoidable Delay	N
Use	U	tired (delay for overcoming fatigue)	T
Inspect	I	Preposition for Next Operation	P
Careless or avoidable delay	C	Release Load	R

The meaning of the headings given below is as follows:

I	Intelligence	F.	Fingers
A	Arms	L	Legs
H	Hands	V	Vision
E	Hearing		

Wherever a letter occurs beneath one of these headings it indicates that this particular faculty is required to perform this operation wherever it occurs, and wherever the column is blank, it means that this faculty is not required to perform this operation.

MOTION	I	A	H	E	F	L	V	Peculiarity
Search	I	A	H		F		V	Should be avoided
Find	I	A	H		F		V	" "
Select	I	A	H		F		V	Can generally be avoided by making selection before material has become confused, and by keeping lots in selected form.
Grasp		A	H		F	L		A machine operation Time .003-.005
Position		A	H		F			Should generally be performed as part of a second operation
Transport Loaded		A	H			L		Machine operation

Search	I A H T V	should be avoided
Find	I A H T V	" "
Select	I A H T V	Can normally be avoided by making selection before material has become unmixed, and by keeping lots in sel-
Grasp	A H T L	A machine operation. Time .005-.009
	A H T	Should normally be performed as part of a second operation
	A H L	Machine operation.

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B Meaning

The meaning of the headings given below is as follows:

A Arms	T Legs

Delay	D	Release Upon	R
Unreleas or avoidable delay	U	Operation	P
Inspect	I	Stenosition for next operation	
Use	C	Used (delay involved)	
Transport Empty	E	Necessary or unavoidable delay	N

Release Load	A H F L	Machine operation Time: .003-.005
Assemble	I A H F L V	
Disassemble	A H F	
Inspect	I A H E F V	Should generally be consolidated so as to make a separate operation for several people
Preposition for Next Operation	A H F	
Transport Empty	A H	Machine operation Time:.004-.006
Unavoidable Delay		
Avoidable Delay		
Delay for Overcoming Fatigue		

The utility of this table can be readily understood from the following instructions given to the field engineers of the American Red Cross. When inspecting an operation, it is always well to examine it in the light of this table; for instance, if an operation does not require one of the six elements of motion that are listed under vision, it is not necessary to require vision for that particular operation, unless the safety condition enters in going to and coming from work. In that case, the thing that you want to watch is whether there is some way that the difficulties from the safety standpoint can be overcome.

It does not necessarily mean, however, that if one of the six elements of motion mentioned should be included in an operation that a blind man cannot handle the work, because it may be possible to substitute the hands, the fingers, or even the arms for the operation that is now performed by the eyes. A very good illustration of this found in the typewriter, where the hands and fingers take the place of the eyes entirely in the "search", find and select operations while the eyes are not used on the assemble" and "use" operations. Inspection is taken care of by another party who measures up the quantity of work done, and thus, the entire operation becomes one for the fingers and the hands, and vision is not required. The same thing is true of a wide range of operations. You will find comparatively few operations where the eyes are not used now. The question for you to decide is whether the hands and fingers can be made to take the place of the eyes on the operation as performed.

Assemble	I A H E V	
Inspect	I A H E V	Should generally be consolidated so as to make a separate operation for manual inspection
Preposition for Next Operation	A H E	
Transport Empty	A H	Machine operation
Unavoidable Delay		
Delay for Overcoming Fatigue		

The utility of this table can be readily understood from the following instructions given to the field engineers of the American Red Cross. When inspecting an operation, it is always well to examine it in the light of this table; for instance, if an operation does not require one of the six elements of motion that are listed under vision, it is not necessary to require vision for that particular operation, unless the safety condition enters in going to and coming from work. In that case, the thing that you want to watch is whether there is some way that the difficulties from the safety standpoint can be overcome.

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In the case of the arms, you will not find any one operation where the arms are used for all the elements of motion as noted. In many cases it will be possible to substitute the eyes for the arms on "search," "find," and "select" operations. In fact that is what is generally done. The same thing is true with the hands and fingers. It will be necessary for you to examine each motion in detail in order to determine which of the faculties are used in performing that motion, and then to determine whether some other faculty can take the place of the faculty that is being used, thereby eliminating some of the requirements of the job. You must remember, however, that it is not a good policy to eliminate the requirements of the job if it seems that you are going to cut down the output.

In case of the legs, "grasp" operations, "release load" operations, and "use" operations are generally included when substitution is made for the arms and hands. In fact, in an ordinary shop manufacturing a straight line product, the legs are the easiest thing for which to find a substitute, since a stool, in many cases, can take the place of the legs.

Perhaps the place where the biggest showing is made is in the intelligence qualifications. It is well to remember that any operation which does not require intelligence very seldom requires a man. A machine can nearly always be devised to take the place of the man, where intelligence is not involved. It will be surprising to find out how many such operations there are, and you will find that the thing for you to do is to watch out for this point in making your studies.

Nor is the above the only use which can be made of this table. The examination for automatic machinery is even better. For instance, when more than standard time is taken in any case, something is generally wrong, and on the average, it will be found that this holds true over a wide range of industrial operations today. When, for instance, more time is taken for grasp and release load operations than that given in the table, a different sort of grasping device is devised, and, as a general rule, this is very simple when you understnad what is to be done. Perhaps the tool is too poorly placed; perhaps it is too far away from the worker; perhaps the worker's attnetion is diverted; perhaps there are unnecessary fatigues-often the lack of a foot stool. All of these things and other items will appear when you study the motions from the standpoint of their requirements.

Mathematics on Biology by Elderon is a very good book to give some idea of the possibilities of charting motions. A chapter headed "Arrangements for Greater Improvements" will be of special interest

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to every film reader. A very good curve study of any chart will be afforded by the following:

Chart 1. This will be each of the sixteen subdivisions arranged in accordance with the total length of time in which each of them appears in the simultaneous motion cycle chart.

Chart 2. This will be the sixteen subdivisions arranged in the same way according to color that they appear in Chart 1, but this chart will be for the number of times that each one of the subdivisions occurs in the simultaneous motion cycle chart.

Chart 3. This will be average time of the sixteen subdivisions arranged in accordance with their quantity.

Chart 4. This will be the minimum time in each of the sixteen subdivisions.

A study of these charts, in many cases will give you the cue for labor saving devices.

To thoroughly familiarize the moving picture reader with the terms, we would advise the beginner to take an operation with which he is familiar, and mentally apply the proper designations to the elements of motion as observed. The terms are as applicable to biscuit making as to core making or as to ball playing or chair finishing. For instance, carrying flour to the bowl would be "transport loaded" taking the biscuits from the pan would be disassemble, etc.

However there are some terms which are confusing even to those most experienced in the science of motion; for instance, to a question as to the difference between "transport empt," and search the leading exponent of motion study replied: "Transport empty is used only when the working member has find and select in view-in other words, the turning from a transport loaded operation.

If reach is an element, you have immediately search, find, select to be considered." We have again: "The purpose of search is to cause the worker to look to the location of materials and tools. It is important to emphasize this so as to have standardized location, obvious sequence, automatic notation as to location. If there is no use for the eye when the hands go to a tool or part, then the term we use is transport empty."

It is well for the film reader to know what the purposes of film reading are from the beginning. They are;

Chart 1. This will be each of the sixteen subdivisions arranged in accordance with the total length of time in motion each of them appears in the simultaneous motion cycle chart.

Chart 2. This will be the actual subdivisional time-val in the same way according to which Chart 1. was laid out. It will show the amount of time each one of the subdivisions occupies in the simultaneous motion cycle chart.

Chart 3. This will be average time of the sixteen subdivisions arranged in accordance with their quantity.

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It is well for the film reader to know what the purposes of [illegible]

1. To reduce the time required for each operation considered on the film, and make it possible for an engineer to get a graphic idea of time when viewing the picture itself.

2. To enable the worker to get the easy improvements before the higher priced engineer attempts to look for the more difficult ones.

3. To reduce the findings to a permanent form.

4. To give a graphic representation of the motions.

The personnel required in film reading consists of one operator who may be either a woman or an engineer who is beginning his training as a time study man. The operator will turn the crank of the projecting machine and tell the time at the beginning and the end of the motion, to a recorder. The recorder should be a young lady who can write long hand from dictation.

The materials required for film reading are as follows:

1. An ordinary room at least ten feet long which can be easily darkened. The room can be totally darkened if preferred, but this is not necessary.

2. One American Projectoscope, manufactured by the American Film Company of Chicago. This should be the hand driven model.

3. One screen three feet by four feet which will not reflect the light. A white plaster wall coated with bluish white paper is the best. A light gray may also be used.

4. One table on which to set the machine with sufficient additional space for note paper or for mending films. Where possible a square hole should be cut in the side of this desk and fitted with ground glass under which is an electric light, so as to permit easy work with films. A diagram is shown herewith as Figure 3.

5. One table or desk large enough to permit one person to write notes.

6. Electric connections for both lamp and Projectoscope.

A. One electric light for the recorder's use. This may be either a desk lamp or a standing lamp with reflector.

B. The cost of nitrogen electric bulbs for the projecting machine is four dollars each, and these may be bought from the American Projectoscope Co. of Chicago. The average life of a nitrogen electric bulb for a Projectoscope is seventy-two hours, according to the American Projectoscope Co. A light may be used for months, however,

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by turning/off while the reader writes notes. Frequent turning off of the light has the double advantage of saving light current, and reducing the possibility of setting fire to the film. The plug of the Projectoscope wears out if too frequently removed, so it is best to place a switch at the end of the table where the projectoscope is placed, allowing a sufficient length of cord between the table and wall socket to permit the Projectoscope to be placed at different distances from the wall. A Benjamin No. 92 multiple light cluster is very good as it permits you to attach light and lantern to the same wall socket. The reading light is provided with a switch of its own.

7. Chairs.

8. A considerable quantity of paper ruled as shown in Form 1.

9. Films to be read.

10. One extra reel for the Projectoscope. Reels with steel spools are preferred to those with wooden centers. The wood wears down and fails to catch on the ridge in the center of the magazine. When fitting the reel onto the axis, hold the axis firmly with one hand, turn the reel around, pressing it forward until it catches on the edge of the axis. The scraping sound, when manipulating the machine is an indication that the reel has slipped from the ridge.

In turning a Projectoscope, follow the suggestions given in the directions which come with the machine. It is well to remember the following:

1. Never have doors open when the light is lit.

2. In case of fire inside the Projectoscope, do not open the doors. The fire will smother itself automatically if the doors are kept closed.

3. When running the film, be sure to watch the inside of the Projectoscope carefully through the window to see that the machine is working properly.

4. After using the machine eight hours, it should be oiled. The small screw on the right side of the Projectoscope at the top of the machine box covers an oil hole.

5. The glossy side of the film should be on the inside. If the letters look as if reflected in a mirror on the screen, it is because the glossy side is not on the inside.

6. Sometimes the films, after having been used, or after having been mended, have the end at the beginning. In this case, put the reel in the left hand magazine and wind onto the reel in the magazine at the right. To rewind the film, turn off the machinery by pressing down the lever under the outside lens. Slip the film that is coming

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down the lever under the outside lens. Slip the film that is coming

out of the left hand reel over the cogs of the left feed socket at the right side on the reel in magazine 1 on the right side. Use the smallest handle on the axis of magazine 1 and turn forward. To turn on the machinery, press the button just above the lever.

7. When the film glides through the Projectoscope with no audible snap, the film gate is open probably, and often causes the films to be injured. Another isgn that the film gate is open is when the picture on the screen wabbles.

8. The framing device in the left hand corner of the left door of the machine may be used to reframe a picture, but care should be used as the film does not always fit the holes over the cogs and causes the film to split at the holes. If a picture is continually getting out of frame, that is, if the black lines are not just at the bottom and top, it is a sign that the holes are injured. The film should be immediately patched at the point of the defective holes, or the split holes will cause the film to deteriorate still further.

9. Patching films has already been mentioned; but in the middle of the reel it is not suitable to rewind the film onto one reel in order to mend it. To mend film, remove edges from the roller to take long leads from each magazine. Scrape if desired, and cement over the glass in the table. If ground glass is not available, a glass ink well is very well adapted to this purpose, provided an electric light is placed just above the ink well. The bottle holds the film in position and keeps the dull side of the ends right side up.

A horizontal slit across the top of the American Projectoscope would have the following advantages:

1. The film, still on the reel, could be removed from the Prljectoscope and replaced, thus expediting changing from one reel to another by eliminating rewinding.

2. It would enable the reader to hold her place by replacing the film in the gate just as it was taken out.

3. It would enable the film reader to make a correct mend on a regular film mending apparatus and then replace the film in the machine.

Poor cement is often a cause for poor patching. The Parkway motion picture house uses cement that can be bought at 412 East Lexington Street, Baltimore. Porr patching is the cause of much tearing of films. In mending broken films be sure to have the brushes clean. Some film manufacturing companies use a brush stuck in a cork and kept constantly moist in the cement to keep it soft. The handle of the brush extends only half way into the cork to avoid the possibility of evaporation. Sharp bends will cause the film to tear in going through the Projectoscope. Decided bends should be cut out of the film.

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7. When the film glides through the Projectoscope with no audible snap, the film gate is open probably, and often causes the films to be injured. Another sign that the film gate is open is when the picture on the screen wobbles.

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If the screen is dark, although the lantern is lit, the film has probably piled inside. In this case, wind the film onto the reel by hand, and shorten the belt by turning the screw that is under the outside lens, to the left two or three times. Sometimes before you have discovered the difficulty, the film has wound around the feed socket several times. In this case, remove the film from the magazine, release the cap above the feed socket and untangle the film.

At thebase of the front of the Projectoscope, there are two screws to regulate the length of the legs. A picture may be placed high or low according to the length of the legs.

Sometimes two pictures of the same operation are equally clear. To determine which is better to read in detail, count the total number of revolutions of the lower clock during each operation, and read the picture of the operation which is done in the shorter time. When determining what picture to choose for reading, select one taken at normal speed and with no breaks in the action so far as can be judged. Sometimes the action is continuous although the time is not, owing to the fact that, when the picture was taken, the negative gave out before the operation was completed. In this case, make two charts, and add the elapsed time of each. The picture taken when the "star" is working slowly and pictures taken at a short distance from the camera that do not include the clock, we used for finding out those points that are not clear in the other picture. Since the"star" when working slowly cannot make the same motions as when working at normal speed, the slow pictures must be read as suggestions as to what probably occurs in the fast pictures, rather than as a basis for actual facts.

When beginning upon an unfamiliar operation, it is well for the reader, if possible, to find out the technical terms of the tools and parts. Whether she uses the technical terms or her own terms to describe the tools, diagrams should be drawn to illustrate.

In reading the films, the operator first turns the crank at normal speed to determine what the operation is. Then she turns the picture backwards to the beginning and studies the movements in detail. The operator calls the name of the motion and the time to the recorder, who sets down each motion with the necessary detail and its time on the micromotion sheet, shown herewith as Form 1. In reading, it might be well to remember that all parts of the body will not be performing the same motions at the same time, for instance, the left hand may be "grasping" while the right hand is "using" and at times the fingers may be "grasping" while the hand is "using." These must be noted very carefully in order that improvements may be made. As the work progresses, the operator and recorder will notice items which are of interest, and in many cases will see possibilities for improvement. These should either be included on the note sheet as the work progresses, or should be noted on the sheets of a special loose leaf note book, to be later typewritten and fastened to the chart itself.

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When reading pictures, be sure to note on cross section paper, the position of the article being worked upon. See Form 2. It may be possible to determine the reason for different times required for the same operation. These reasons should be noted, and the different kinds of motions should be put on cross section paper for comparison and record.

The motions for each part of the body must be followed through the entire cycle, and the clock reading of each motion entered in the first column of the micromotion sheet. The symbol representing its proper classification, and the work done by this movement is set down in the column headed "Elementary Motions Shown on Film." It is generally best to follow through one part of the body, and then go back and get the same information for some other part, and so on, until completed, although it is possible, at times, to carry notations for both hands at once, particularly if they work in harmony. It is very important that all parts of the body involved in the operation be followed through very carefully, so that the engineer, going over the final charts, may be able to get a graphic idea of the movements.

On each micromotion sheet, there should be the number of the reel and scene, the subject of the scene, the name of the manufacture, where taken, and the name of the "star." The pages of each sheet should be numbered, and the date of the reading noted. This data is very important as it ties the charts, films, and micromotion sheets together. It may be well to repeat here that the lower clock makes twenty revolutions to the minute, while the upper clock revolves once a minute. While the lower clock revolves twice, the upper clock has just moved through one of its ten divisions. In other words, the small clock moves through one division in six seconds, while the large clock takes three seconds for one complete revolution. The smallest division in the lower clock is one two-thousandth of a minute.

For the purpose of teaching the blind, the position of the tool or part could be described in terms of the positions of the hands of an ordinary clock-quarter after, half past, quarter to, or on the hour, etc. These positions could be recorded in the last vacant column of the micromotion sheet. Of course, a fixed point would have to be selected as a center. We should also suggest that a separate list of tools and apparatus used in each operation be made. The more tools that are used, the more would be the necessity for "search" "find" and "select." Therefore, in selecting an operation to be performed by the blind, the number of tools should be considered. This list will call the attention of the reader to the possibilities of suggesting combination tools or noting where the combination tools are already used.

For the purpose of teaching the girl, the position of the tool or part could be described in terms of the positions of the hands of an ordinary clock-dial, half past, quarter to, or on the hour, etc. These positions could be recorded in the last vacant column of the micromotion sheet. Of course, a fixed point would have to be selected as a center. We should also amused that a separate list of tools and appliances used in each operation be made. The more tools that are used, the more would be the necessity for "reach" and "select". Therefore, in selecting an operation to be performed by the girl, the number of tools should be considered. This list will call the attention of the teacher to the possibilities of suggesting combination tools or noting where the combination tools are already used.

The motions for each part of the body must be followed through the entire cycle, and the short reading of each motion entered in the first column of the micromotion sheet. The symbol representing its proper classification, and the work done by this movement is set down in the column headed "Elementary Motions Shown on Film." It is essentially best to follow through one part of the body, and when to that and get the same information for some other part, and so on, until completed, although it is possible, at times, to carry motations for both hands at once, particularly if they work in harmony. It is very important that all parts of the body involved in the operation be followed through very carefully, so that the engineer, point over the final effect, may be able to get a graphic idea of the movements.

On each micromotion sheet, there should be the number of the reel and scene, the subject of the scene, the name of the cameraman, where taken, and the name of the "star." The types of each sheet should be numbered, and the date of the reading noted. This is a very important as it ties the clerk, film, and micromotion sheets together. It may be well to repeat here that the lower clock makes twenty revolutions to the minute, while the upper clock revolves once a minute. While the lower clock revolves twice, the upper clock has moved through one of its ten divisions. In other words, the lower clock makes three seconds for one complete revolution. The smaller small clock moves through one division in six seconds, while the large clock moves through one division in a minute. A division in the lower clock is one-thousandth of a minute.

On the micromotion sheet, there are two columns marked "Weight and "Distance". These are two of the variables of certain types of motions, such as "transport loaded." Comparative differences may be roughly judged by observing the barred lines of the background. These screens, as described, have foot divisions subdivided into four inch divisions. On the micromotion sheet and the chart, we have used abbreviations to save time. When speaking of all the fingers, we use F. When speaking of acertain one, we give it a number-the forefinger would be represented by the abbreviation F1, the next by F2, etc. The thumb would be T, the arm A, W.B. stood for work box, C.P. for core plate. If a letter is used in the center of a line to describe a motion, it is underlined to identify it as a motion. The work of reading motion pictures is likely to be tedious and should be alternated with charting.

CHARTING

The purpose of charting operations is to give an accurate graphic conception of a cycle of motions, and, through this graphic representation, to enable the engineer to determine what improvements are possible in the operation. The personnel in charting is the same as that in reading, and the work is simply alternated with the reading. The materials required are as follows:

1. One roll of one-tenth inch ruled cross section paper, twenty-two inches wide, which consists of twenty one-inch squares with an inch margin

2. Heading strips. See Form 3A attached.

3. Two stands for colors such as per diagram shown herewith as Figure 4. These stands should be made of card board boxes. Two stands, one the top of the box, the other the bottom of the box are better than one stand for all the colors, as the stands canbe used for a box to carry the colors from one place to another. For convenience in charting, the crayons are placed in the boxes, opposite the names of the motions which they represent.

4. Recorder's note book.

5. A good pen for fine lettering

6. Lettering ink.

7. A long table and high chair, preferably a swivel chair with leather seat. This enables the draftsman to stand or sit-change his position at will-and reduces fatigue.

8. A music rack is a good thing to hold the micromotion sheets before the reader while charting.

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1. One roll of one-tenth inch ruled cross section paper, twenty-two inches wide, which contains of twenty one-inch squares with an inch margin

2. Reading strips. See Form 3A attached.

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5. A good pen for fine lettering

6. Lettering ink.

7. A long table and high chair, preferably a swivel chair with leather seat. This enables the draftsman to stand or sit- change his position at will-and reduces fatigue.

8. A music rack is a good thing to hold the micromotion sheets before the reader while charting.

and "Distance". These are two of the variables of certain types of motions, such as "transport loaded." Comparative differences may be roughly judged by observing the bared lines of the background. These screens, as described, have foot divisions subdivided into four inch divisions. On the micromotion sheet and the chart, we have used abbreviations to save time. When speaking of all the fingers, we use H. When speaking of certain one, we give it a number-the forefinger would be represented by the abbreviation H1, the next by H2, etc. The thumb would be T, the arm A&F.S. stood for work box, C.P. for core plate. If a letter is used in the center of a line to describe a motion, it is understood to identify it as a motion. The work of reading motion pictures is likely to be tedious and should be alternated with charting.

When making up your sheet, first place the heading strip shown herewith as Form 3 A across the top of the chart. To place the heading strip at the top of the chart, wet about two inches at the left of the heading strip with a nearly dry rubber sponge. Paste down, but be sure the strip is perfectly matched against one of the heavy lines of the cross section paper. Use a paint brush to smooth down. A paper towel is good for drying. Wet and paste down only a few inches at a time. The heading strips are so printed that part of the body noted thereon fits into its proper one-tenth inch division, and gives approximately one inch between the divisions. If a chart is long, it is very convenient to have an extra heading on the chart, but not pasted to it, to refer to. Each inch space of this heading can be to it, to refer to. Each of the smaller divisions can be numbered from left to right and right to left in Arabic numbers. This is for the purpose of more easily finding in which division to write on the cross section of the paper. To keep this in shape and prevent it from sticking to the chart, it is well to place a heavy piece of paper at the back. See Form 3B.

Beginning, on the second line, put down in the first column, at the left, the clock readings as shown in the detail sheet remembering that the clock readings are all in two-thousandths of a minute represented by one inch of the length of the chart. The clock reading must be put down for each change in action. At the left of the first column, put the elapsed time as shown on your calculation sheet. As a matter of convenience for finding the proper line for filling in the time column, these lines may be numbered in pencil at the left hand (unruled) margin by twenties-20,40,60, etc. Then three inch lines numbers may be erased later and the lines numbered in ink in tens-10-20,30,etc.-showing approximately what the elapsed time is in thousandths of a minute instead of two-thousandths of a minute. When possible, the upper or tenth-minute time should be noted down in the center of the first column, so that a motion can be referred to in terms of the upper clock, and in reviewing the picture, the motion can be identified. This upper clock motion is differentiated from the other by placing a circle around it. As it is frequently impossible to read this clock, the reader may not be able to note it. If this is the case, the one who charts, notes in the space to the right of the first column the number of revolutions of the lower clock as well as the time; for instance, when the time is twenty, and the clock has revolved twice, 220 should be noted in the third secion, of the time column. As the clock readings are entered on the chart, take the color from the box which represents the motion and color within the limits of the clock reading, the column which represents the part of the body that is performing the movement. Then put in the second clock reading and the second motion in the same way. Copy on the chart all the data on the calculation sheet until the movement of all the parts of the body required for this work have been charted. Enter in the space allowed at the left hand side of the color column, the description of the work performed between the clock readings. See Figure 5. One person can work on charting as rapidly as two, and it is suggested that, while the operator is charting, the motions, the recorder be calculating the notes in advance, that is substracting the clock readings from each other

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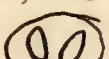
the movement of all the parts of the body required for this work have been charted. Enter in the space allowed at the left hand side

down only a few inches at a time. The reading strips are so printed that part of the body noted thereon fits into its proper one-tenth inch division, and gives approximately one inch between the divisions. If a chart is long, it is very convenient to have an extra reading on the chart, but not pasted to it, to refer to. Each inch space of this reading can be to it, to refer to. Each of the smaller divisions can be numbered from left to right and right to left in Arabic numbers. This is for the purpose of more easily finding in which division to write on the cross section of the paper. To keep this in shape and prevent it from sticking to the chart, it is well to place a heavy piece of paper at the back. See Form 3a.

and entering the individual time in the sixth column of the original record sheet. The calculation can be set by determining whether the total elapsed time equals the elapsed time covered on the sheet. The calculating should be done during the reading. This has the advantage of giving the reader a conception of the elapsed time of each motion, and calling her attention immediately to unnaturally long durations of time, which may suggest an improvement in the operation. In some vacant space on the chart, put in the number of film, and number of scene, the name of the factory, the name of the operation, the date they were taken, the name of the "star," the name of the photographer, the name of the reader, and the date of the reading. In the margin of the chart, note whether the worker is a man or woman; if a man, the symbol

is used; if a woman, the symbol  is used.

In making charts for work for the blind, or for the purpose of reminding the motion study man to make the work easier, the eye column should be taken into account. The lens column should be filled in if the eyes look at things at a distance. If the object looked at is darker or lighter than the previous one, the pupil has become larger or smaller. If the eyes turn to their corners, the eye balls have been used.

When it is difficult to describe an action, an enlargement should be taken and pasted on the chart. According to Major Gilbreth, "If you desire to make enlargements from negatives of motion picture films, you will get the best results, of course, by having them made for you at a regular photograph gallery. But if this is not feasible, and you are willing to put up with fourth rate photographs, you can project them through your Projectoscope through a petition in a dark room, and have the bromide paper on the wall, and in this way, get a photograph that will be pretty good. The projector has not a sufficiently good lens to give a first class result, and furthermore, it requires considerable skill in photography to do this carefully, but you can learn it if you think it worth while.

"To identify the right frame for enlargement, we used the Dennison tags, about an inch square, which were tied opposite to the hole opposite the frames that we desired to enlarge. You must remember, however, that every time that you run your negatives, you are bound to scratch them more or less, and every scratch of one hundredth of an inch makes a scratch of an inch when you put it on a screen ten feet wide. I do not suggest every cutting out a frame from the film. It would be better for you to have a celluloid positive made from it; then have as many prints as you like made from the negative, which in turn is made from the celluloid positive. In other words, from the negative, make the celloid positive; from the celluloid positive, make the celluloid negative; from the celluloid negative, make as many enlargements or prints as you like.

is used; if a woman, the symbol is used.

In making sheets for work for the blind, or for the purpose of reminding the motion study man to make the work easier, the eye pupil has become larger or smaller. If the eyes turn to their corners, the eye balls have been used.

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Of course, every time that you duplicate the photography, you are bound to lose a little, and on the other hand, in the hands of a skillful photographer, sometimes you are able to make a better duplicate reproduction than the original negative. We use our ordinary projecting machine for finding a certain film to enlarge. We have a rather better, or more handy projecting machine than the Projectoscope for the purpose."

USE OF CHARTS

The man who uses the charts should be a first class engineer. The best method is to place the chart on the recording table, while the operator turns the crank, or to have the recording table and the Projectoscope standing close together, so that the engineer may be able to project the picture himself and look at the chart at the same time. Then the engineer will have the motions involved definitely connected with the chart. The chart should be studied to determine

1. whether any of the motions require more than standard time.

2. whether the identical motion requires more time in one instance than in another, and if so,

3. how the longer time can be shortened.

4. whether two members of the body can be set to working together, and thus cut down the time.

5. whether there is any preponderance of "search", "find," or "select" movements.

6. whether there is any one motion which requires such a large portion of the time involved that it would pay to make a special study to determine how this portion of the operation could be eliminated. For instance, in wiping off chairs it was found that the "grasping" and "using" operations were much greater than all the remaining operations combined. The question that immediately presented itself was as to how these operations could be eliminated by machine methods, and as a result, our present method of wiping chairs was evolved.

7. whether any part of the body interferes with any other part in performing a given operation.

8. whether motions can be interchanged from one member of the body to another, and thus eliminate part of the time on both.

9. whether any of the motions can be eliminated and still obtain the same results.

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For instance, in wiping off chalks it was found that the "grasping"
and "using" operations were much greater than all the remaining
operations combined. The question then immediately presented itself
as a result, can [illegible] motion be eliminated by another motion, and

7. whether any part of the body interferes with any other part
in performing a given operation.

8. whether motions can be interchanged from one member of the body
to another, and thus eliminate part of the time on both.

9. whether any of the motions can be eliminated and still
obtain the same results.

10. what the possibilities are for automatic machiner. When making a study of a picture, the engineer will make note of all the ideas he may have regarding the possibilites of the operation. If automatic machinery may be substituted, he should write out, as nearly as possible, what types of machinery he believes suitable, and what it should accomplish together with suggestions as to the design. The same should be done for changes in apparatus. If possible, he should make notations of changes in the operation, when they do not involve new apparatus, at the point on the chart itself where they should take place. He should then call on the "star," or some other workman, point out to him the changes which he belives possible, and have him try the new method until he becomes more or less familiar with it. When the overal time of performing it under the new method should be taken and compared with the overall time of performing it under the old method. The learning curve of most operations is approximately as shown in Figure 6, and consequently if the time required for the first attempt at the new operation is less than the time required for the old operation, it may be safely assumed that the new operation would take about fifty percent to sixty percent of the time of the old.

The picture may also be used to teach beginners how to perform the operation. In case the operation is highly repetitive, and cannot be reduced to permit the use of automatic machinery, the new series of motions should be photographed to form a permanent record of the quicker method.

In teaching the students from motion pictures, especially in teaching the blind, the teacher should watch the motions on the screen and practice each motion of the revised operation, until he is able to perform it in standard time. The students should then be brought in, shown the object of the operation, and taught to imitate the picture, motion by motion, and so on until fairly familiar with the individual motions. The combination should then be studied until he is able to perform the operation in standard time. If this is done, it is safe to say that within a few days the beginning worm will be able to do the operation better and faster than any expert, since it is almost impossible to make this study of an operation without discovering methods of shortening it, and the beginner has nothing to unlearn.

In designing machinery for new methods, it is generally best that the designer be a first class designing engineer, or one of that type which sometimes exists around the plant-the all around mechanic who is born a mechanicq and inventor. He should review the suggestions very carefully. He should then be allowed sufficient time and resources to draw up his ideas and experiment with the different features involved, until a special machine has been invented. It can safely be said that an operation which does not require judgment can be performed by an automatic machine, provided there is enough work to be done to justify the building and the setting of the machine. The motion picutre camera is the one piece of apparatus which allows the engineer, the mechanic, and the financier to talk in the same language, and to determine both the needs for the machine and proper design of the machine to perform the operation.

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APPENDICES

A P P E N D I X A

CLASSIFICATION

OF

INDUSTRY

APPENDIX

Directions for use of

Classification of Industry

1. Open up the last sheet of the classification. This sheet applies to every other sheet in the entire set.

2. The page referred to in the page reference column is in each case a continuation of the sheet which contains the page references.

3. All items following the first two letters in the classification and preceding the last two columns of the classification are enclosed in parentheses.

4. The information must be filed alphabetically and numerically, according to code.

5. In propaganda and in placement work, the divisions shown will be found to show very closely the proper divisions of industry with which to deal.

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CLASSIFICATION OF INDUSTRY

INDEX SHEET

GENERAL CLASSIFICATION

COURCE OF RAW MATERIALS	Class of RAW MATERIALS	FOR FURTHER CLASSIFICATION SEE PAGE
A. Agriculture	F. Forest Products	A.F. (P. 2)
	L. Live Stock Animal Products	A.L. (P.3)
	P. Plant Products	A.P. (P.4)
	S. Sea and Other Water Materials (Fisheries)	A.S. (P.5)
	V. Variously Classified	
M. Mining	C. Carbons (Natural)	M.C. (P.6)
	M. Metals	M.M. (P. 7)
	O. Oils and Natural Gases	M.O. (P.8)
	R. Rocks and Soils	M.R. (P. 9)
	S. Salts (Mineral) Not included in Rocks and Soils	M.S. (P.10)
	V. Variously Classified	
S. Services (Not yet classified)	L. Legal	S.L. (P.11)
	M. Medical	S.M. (P. 12)

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Cont. from
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CLASSIFICATION OF INDUSTRY CONT.

FOREST PRODUCT CLASSIFICATION

CLASS OF RAW MATERIAL	TYPE OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
A.F. Forest Products	1. Structural Timber	A.F.(P.2A)
	2. Silos and Tanks	
	3. Lumber	A.F.(P. 2B)
	4. Wood Distillation	
	5. Wood pulp	A.F.(P. 2C)
	6. Bark	A.F.(P. 2F)
	7. Sap	A.F.(P.2G)
	8. Fruit	A.F.(P.2H)
	9. Variously Classified	

CLASSIFICATION OF INDUSTRY CONT.

CLASS OF RAW MATERIAL	TYPE OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
	1. Structural Timber	A.I.(P.2A)
	2. Silos and Tanks	
	3. Lumber	A.I.(P. 2B)
	4. Wood Distillation	
7. Forest Products	5. Wood Pulp	A.I.(P. 2C)
	6. Bark [illegible]	A.I.(P. 2E)
	7. Rag	A.I.(P.2G)
	8. Resin	A.I.(P.2H)
	9. Variously Classified	

CLASSIFICATION OF INDUSTRY CONT.

STRUCTURAL TIMBER CLASSIFICATION.

CLASS OF INDUSTRY	INVISION OF INDUSTRY	TYPE OF INDUSTRY
		1. Bark
	B By Products	
		2. Sawdust
	C. Creosoted Paving Blocks	
	P. Posts	
	R. Rods	
	T. Ties and Rails	
A.F.(S) Structural Timber		
	S. Shingles and Laths	
	M. Sawmill Products	
	V. Variously Classified	
A.F.(2) Siles and Tanks		

A.F.(2) Silos
and Tanks

CLASSIFICATION OF INDUSTRY CONT.

FOREST PRODUCTS CLASSIFICATION CONT.

TYPE OF INDUSTRY	DIVISION OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
	B. Boxes and Cooperage	A.F.(3B) (P. 2B1)
	C. Car Construction	Cross Index (P. 7B6B)
	F. Furniture	A.F.(3F) (P. 2B1)
	G. Sporting Goods	A.F.(3G) (P. 2B4)
	H. Hospital Supplied	
	I. Instruments (Musical)	A.F.(31) P.2B4)
	M. Matches	
A.F.(3) Lumber	O. Office Fixtures	
	P. Planing Mill Products	
	R. Wood Turnings	A.F.(3R) (P. 2B4)
	S. Seating	A.F.(3S). (P. 2B11)
	T. Tables	
	U. Undertakers' Supplies	A.F. (3U) (P. 2B11)
	W. Wagons and Vehicles	A.F. (3W) (P. 2B11) Cross indes (P. 7B2)
	V. Variously Classified	

TYPE OF INDUSTRY	DIVISION OF INDUSTRY	
	B. Boxes and Crates	
	C. Car Construction	Cross Index (p. [illegible])
	F. Furniture	
	G. Sporting Goods	
	H. Hospital Supplied	
	I. Instruments (Musical)	
A.F.(5) Lumber	O. Office Fixtures	
	P. Planing Mill Products	
	R. Wood Turnings	
	S. [illegible]	A.F.(38). (p. [illegible])
	T. Tables	
	U. Undertakers' Supplies	A.F. (30) (p. [illegible])
	W. Wagons and Vehicles	A.F. (3W) (p. [illegible]) Cross index (p. [illegible])
	V. Variously Classified	

Cont. from -2 P- 100

LUMBER CLASSIFICATION CONT.

DIVISION OF INDUSTRY	CLASS OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
A.F.(3C). Cooperage and Boxes	1. Baskets	
	2. Boxes	
	3. Cooperage	
	4. Hoops	
	5. Packing Boxes	
	6. Tabacco Boxes	
	10. Variously Classified	
A.F.(3F) Furniture	1. Baby Carriages	
	2. Benches and Chairs	A.F.(3F.2) (P. 2B1B)
	3. Case Goods	A.F.(3F.) (P. 2B1B)
	4. Desks	
	5. Fixtures	
	6. Hospital Supplies	
	7. Kitchen Cabinets	
	8. Sewing machine Boxes	
	9. Picture Frames	
	10. Refrigerators	
	11. Upholstered Furniture	
	12. Drafting Room Furniture	
	13. Seats	
	14. Tables	(A.F.(3F. 14) (P. 2B2A)

CLASSIFICATION OF INDUSTRY CONT.

CHAIR AND CASE GOODS CLASSIFICATION

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION
	1. Office Chairs
	2. Dining Room Chairs (High Grade)
	3. Dining Room Chairs (Medium Grade)
	4. Dining Room Chairs (Cheap Grade)
	5. Bed Room Chairs (High Grade)
	6. Bed Room Chairs (Medium Grade)
A.F.(3F.P.) Benches and Chairs	7. Wood Seat Chairs
	8. Fancy Chairs and Rockers
	9. High Chairs and Kiddies' Chairs
	10. Bent Wood Chairs
	11. Double cane chairs
	12. Piano Benches
	13. Reed and Cane chairs
	14. Wheel Chairs
	15. Swings
	20. Variously classified
	1. Beds
	2. Book Cases
	3. Dressers and Chiffoniers
	4. Buffets
	5. Shirt Waist Boxes
	Cedar Chests, Costumes and Novelties
A.F.(3F.C) Case Goods	6. Porch Swings
	10. Variously Classified

CHAIR AND CASE GOODS CLASSIFICATION

CLASS OF INDUSTRY	SPECIFIC OR SERVICE ITEM
	1. Office Chairs
	2. Dining Room Chairs (High Grade)
	3. Dining Room Chairs (Medium Grade)
	4. Dining Room Chairs (Cheap Grade)
	5. Bed Room Chairs (High Grade)
	6. Bed Room Chairs (Medium Grade)
A.E.(St.T.)	7. Wood Seat Chairs
Benches and Chairs	8. Fancy Chairs and Rockers
	9. High Chairs and Kiddies' Chairs
	10. Bent Wood Chairs
	11. Double cane chairs
	12. Piano Benches
	13. Reed and Cane chairs
	14. Wheel Chairs
	15. Swings
	20. Variously classified
	1. Beds
	2. Book Cases
	3. Dressers and Chiffoniers
	4. Buffets
	5. Shirt Waist Boxes
	Cedar Chests, Costumes and Novelties
A.E.(St.C) Case Goods	6. Porch Swings
	10. Variously Classified

CLASSIFICATION OF INDUSTRY CONT.

FURNITURE CLASSIFICATION

DIVISIONS OF INDUSTRY	CLASS OF INDUSTRY
	1. Tables and Novelties
	2. Library and Extension
A.F.(3F.T) Tables	3. Office
	4. Variously Classified

1. Tables and Novelties
2. Library and Reference
3. Office
4. Vertically Classified

CLASSIFICATION OF INDUSTRY CONT.

PLANING MILL CLASSIFICATION

DIVISION OF INDUSTRY	CLASS OF INDUSTRY
A.F.(3P.) Planing Mill Products	1. Blinds
	2. Flooring
	3. Moulding
	4. Sash and Doors
	5. Panels
	6. Veneer
	10. Variously Classified

Classification of Industry Cont.

LUMBER CLASSIFICATION

DIVISION OF INDUSTRY	CLASS OF INDUSTRY
.F.(3G) Sporting Goods	1. Pool and Billiard Tables
	2. Bowling Alleys
	3. Base Ball Bats
	4. Variously Classified
A.F.3I) Instruments Musical	G. Graphophones
	P. Pianos
	S. String Instruments (Wood)
	V. Variously Classified
A.F.(3R) Wood Turnings	B. Bobbins and Shuttles
	F. Fires Arms (Wooden Parts)
	L. Ladders
	S. Spokes and Wheels
	T. Tool Handles
	U. Umbrella Sticks and Canes
	X Spools
	V Variously Classified

DIVISION OF INDUSTRY	CLASS OF INDUSTRY
	1. Pool and Billiard Tables
	2. Bowling Alleys
J.F.(3G) Sporting Goods	3. Base Ball Bats
	4. Various Classified
	5. Gramophones
	6. Pianos
	7. String Instruments
	V. Various Classified
	B. Bobbins and Shuttles
	[illegible]
	[illegible]
	3. Spokes and Wheels
A.F.(3H) Wood Turning	4. Tool Handles
	U. Umbrella Sticks and Canes
	X Spools
	V Various Classified

CLASSIFICATION OF INDUSTRY CONT.

LUMBER CLASSIFICATION CONT.

DIVISION OF INDUSTRY	CLASS OF INDUSTRY	
A.F(3S) Seating	1. Church	
	2. Depot	
	3. Opera	
	4. Shoe Shining	
	10. Variously classified	
A.F.(3U) Undertakers Supplies	1. Shipping Boxes	
	2. Caskets	
	3. Hearses	
	4. Variously classified	
A.F.3W) Wagons and Vehicles	1. Aeroplanes	
	2. Boats and Canoes	
	3. Carriages ang Buggies	
	4. Farm Wagons and Trucks	Cross index to M.M. (2B6) (P. 7B½)
	5. Hand Trucks	
	7. Motor Bodies	
	8. Push Carts	
	9. Sleighs	
	10. Wagons	
	11. Wheel barrows	
	20. Variously classified	

A.T.(3S) Seating

1. Church
2. Depot
3. Opera
4. Shoe Shining
10. Variously classified

A.T.(4S) Shipping
Supplies

1. Shipping Boxes
4. Variously classified

A.T.3W) Wagons
and
Trucking

1. Aeroplanes
2. Boats and Canoes
3. Carriages and Buggies
4. Farm Wagons and Trucks — Cross index to M.M. (236) (P. 728)
7. Motor Bodies
8. Push Carts
10. Wagons
11. Tunnel Carriers
20. Variously classified

CLASSIFICATION OF INDUSTRY CONT.

FOREST PRODUCTS CLASSIFICATION CONT.

TYPE OF INDUSTRY	DIVISION OF INDUSTRY	CLASS OF INDUSTRY
A.F.(4) Wood Distillation		
	A. Artificial Silk	1. Textiles(See silk)
	B. Cinnamon	
	D. Dye Wood	
A.F.(6) Bark	K. Cork	
	P. Paper	
		1. Accessories
		2. Boots and Shoes
		3. Clothing
	G. Gutta Percha	4. Druggists' Sundries
		5. Novelties
		6. Tires and Tubes
A.F.(7) Sap		10. Variously Classified
	M. Maple	
	R. Resin	
	T. Turpentine	
	V. Variously Classified	
	C. Canned and Pickled	
	D. Dried	
A.F.(8) Fruit	R. Raw	
	Variously classified	

CLASSIFICATION OF INDUSTRY CONT.

PAPER CLASSIFICATION

DIVISION OF INDUSTRY	CLASS OF INDUSTRY
	1. Artificial paper flowers
	2. Lamp Shades
	3. Fans
	4. Articles cut from Paper or thin card board
	5. Marks for Labels
	6. Shreds, Confetti, etc.
	7. Cut Cards for Visiting, etc.
	8. Playing Cards
	9. Cut and Perforated Cards
	10. Lace Paper
	11. Articles of Paper or Thin Card Board Folded, Plaited, or Pasted
	12. Paper Bags
	13. Envelopes for Letters
	14. Folders for Documents
	15. Boxes and Receptacles of Folded and Plaited paper
	16. Lamp Shades of Plaited Paper
	17. Articles of Paper or Thin Card Board Rolled or Pasted
	18. Paper and Card Board Tubes (Tubes for Cartridges, Shuttles for Looms, etc.)
A.F.(6P) Paper	19. Boxes and Cylinder Cases
	20. Cornuoopias
	21. Lamp Shades with Vertical Sides
	22. Articles of Paper and Card Board Assembled and Pasted
	23. Maps, Wallets, and Card Board Portfolios
	24. Boxes for Envelopes and Note Paper
	25. Office System Cards
	26. Record and Classification Cards
	27. Boxes with Covers, Paste Board Boxes for Confectionery, etc.
	28. Articles made of Paper and Sheet Card Board Joined and Molded
	29. Capsules, Covers, and Receptacles Joined
	30. Boxes and Cases Joined
	31. Articles and Utensils of Folded Pulp
	32. Articles for Household Use, Buttons, Toilet Articles, Brushes, Jewels and Ornaments, Brooches, etc., Boxes and Caskets made of Lacquered Board, Cases, etc., Furniture Made of Lacquered Board
	33. Articles for Industrial Uses, Railroad Car Wheels, Automobile Bodies, Building Boards, etc.
	34. Egg Case Fillers
	40. Variously Classified

		CLASS OF INDUSTRY
	1.	Artificial paper flowers
	2.	Lamp Shades
	3.	Fans
	4.	Articles cut from Paper or thin card board
	5.	Marks for Labels
	6.	Surrade, Confetti, etc.
	7.	Cut Cards for Visiting, etc.
	8.	Playing Cards
	9.	Cut and Perforated Cards
	10.	Lace Paper
	11.	Articles of Paper or Thin Card Board Folded, Plaited, or Pasted
	12.	Paper Bags
	13.	Envelopes for Letters
	14.	Folders for Documents
	15.	Boxes and Receptacles of Folded and Plaited Paper
	16.	Lamp Shades of Plaited Paper
	17.	Articles of Paper or Thin Card Board Rolled or Pasted
	18.	Paper and Card Board Tubes (Tubes for Cartridges, Shuttles for Looms, etc.)
A.P.(6P) Paper	19.	Boxes and Cylinder Cases
	20.	Cardboxes
	21.	Lamp Shades with Vertical Slats
	22.	Articles of Paper and Card Board Assembled and Pasted
	23.	Maps, Wallets, and Card Board Portfolios
	24.	Boxes for Envelopes and Note Paper
	25.	Office System Cards
	26.	Record and Classification Cards
	27.	Boxes with Covers, Paste Board Boxes for Corresponding, etc.
	28.	Articles made of Paper and Sheet Card Board Joined and Moided
	29.	Capsules, Covers, and Receptacles Joined
	30.	Boxes and Cases Joined
	31.	Articles and Utensils of Folded Pulp
	32.	Articles for Household Use, Buttons, Toilet Articles, Brushes, Jewels and Ornaments, Brooches, etc., Boxes and Baskets made of Lacquered Board, Cases, etc., Furniture Made of Lacquered Board
	33.	Articles for Industrial Uses, Railroad Car Wheels, Automobile Bodies, Building Boards, etc.
	34.	Egg Case Fillers
	35.	Various; Classified

CLASSIFICATION OF INDUSTRY CONT.

ANIMAL PRODUCTS CLASSIFICATION.

CLASSOF RAW MATERIALS	TYPE OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
A.L. Live Stock Animal Products	L.Wild Animals	A.L.(1) (P.3A and 3A1)
	2. Stock	A.L.(2) (P.3B)
	3. Domestic Animals	A.L.(3) (P.3B)
	4. Fowls	A.L.(4) (P.3B)
	5.Insects	A.L.(5) (P.3E)
	6. Variously Classified	

CLASSES OF RAW MATERIALS	TYPES OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
	1. Wild Animals	A.I.(1) (P.34 and 341)
	2. Bison	A.I.(2) (P.35)
	3. Domestic Animals	A.I.(3) (P.35)
A.I. Live Animal Products	4. Fowls	A.I.(4) (P.35)
	5. Insects	A.I.(5) (P.35)
	6. Vertically Classified	

CLASSIFICATION OF INDUSTRY CONT.

WILD ANIMAL CLASSIFICATION

TYPE OF INDUSTRY	DIVISION OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
	B. By-Products and Oils	A.L.(1B) (P.3A1)
	F. Fur	A.L.(1F) (P.3A1)
A.L. (1) Wild Animals	H. Hides	A.L.(1H) (P.3A1)
	V. Variously Classified	

D. By-Products and Oils — A.E.(ID) (P.SAI)

E. Fur — A.E.(F) (P.SAI)

M. Mines — A.E.(IN) (C.MA)

V. Personal Services

CLASSIFICATION OF INDUSTRY CONT.

WILD ANIMAL CLASSIFICATION CONT.

DIVISION OF INDUSTRY	CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION
A.L.(1B) By Products and Oils	I. Ivory O. Oils W. Whale Bone V. Variously Classified	
A.L.(1F) Fur	C.C. Clothing D. Dressing and dyeing R. Raw skin V. Variously classified	
A.L.(1H) Hides	L. Leather goods	A. Auto Cushions Auto supplies saddlery B. Belting C. Clothing E. Furniture G. Glover and Mittens H. Hats and caps P. Pocket books and novelties S. Shoes and boots T. Trunks and Valises U. Upholstery V. Variously classified
	C. Clothing H. Hides (raw) T. Tanners V. Variously classified	

CLASSIFICATION OF INDUSTRY CODE.

DIVISION OF INDUSTRY	CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION
A.I.(ID) By Products and Oils	I. Ivory O. Oils W. Whale Bone V. Variously classified	
A.I.(IE) Fur	C. Clothing D. Dressing and dyeing R. Raw skin V. Variously classified	
A.I.(IH) Hides	L. Leather goods	A. Auto Cushions Misc. supplies saddlery B. Belting C. Clothing F. Furniture G. Glover and Mittens H. Hats and caps P. Pocket books and novelties S. Shoes and boots T. Trunks and Valises U. Upholstery V. Variously classified
	C. Clothing I. Hides (raw) T. Tanners V. Variously classified	

CLASSIFICATION OF INDUSTRY CONT

LIVE STOCK CLASSIFICATION

TYPE OF INDUSTRY	DIVISION OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
	H. Hides	A.L.(2H) (P.3BL-3B3)
	L. Live Animals	A.L.(2 L) (P.3B1)
	M. Meat	A.L. (2M)(P.3B3)
A.L.(2) Stock		
	O Oils and Other by-Products	
	V. Variously classified	

H. Hides A.I.(2H) (P.3BI-3B5)

A.I.(2)
Stock

CLASSIFICATION OF INDUSTRY CONT.

DOMESTIC ANIMAL CLASSIFICATION

TYPE OF INDUSTRY	DIVISION OF INDUSTRY	CLASS OF INDUSTRY
	B. By-Products and Oils	C. Cat Gut F. Fertilizer V. Variously Classified
	F. Fur (cat) and Rabbit)	C. Clothing D Dressing and Dyes R. Raw V. Variously classified
A.L.(3) Domestic Animals	L. Live animals	C. Cat D Dog H. Hares and Rabbits V. Variously Classified
	S. Skin (dog)	C. Clothing D. Dressing H. Hides (raw) V. Variously classified
	V. Variously Classified	

V. Variously
Classified

CLASSIFICATION OF INDUSTRY CONT.

FOWL CLASSIFICATION

TYPE OF INDUSTRY	DIVISION OF INDUSTRY	CLASS OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
		D. Downs	
	F. Feathers	F. Feather bone	
		P. Plumes	
A.L.(4) Fowls		V. Variously classified	
		D. Dairy Products	A.L.(4L.D.)P.3B5
	L. Live Fowls		
		M Meat	
	V. Variously Classified		

V. Variously
classified

CLASSIFICATION OF INDUSTRY

LIFE STOCK CLASSIFICATION

DIVISION OF INDUSTRY	CLASS OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
	C. Clothing	
A.L.(2H) Hides	H. Hides (raw)	
	L. Leather Goods	
	V. Variously classified	
	C. Cows	A.L. (2L.c) (P.3B1B)
	H. Horses	
	M. Mules	
	S. Sheep	A.L.(2L.S.) (P.3B1B)
A.L.(2L) Live Animals	V. Variously classified	

	G. Cows	A.L. (Ass.) (L.Ass.)
	H. Mares	
	I. Mules	
	S. Sheep	A.L.(SL.S.) (L.SHIP)
A.L.(Ex. Live Animals	J. Perfumes, cleansing	

FOR FURTHER CLASSIFICATION SEE PAGE

	O. Clothing	
A.L.(Ex. Hides	H. Hides (raw)	
	L. Leather Goods	
	V. Variously classified	

CLASSIFICATION OF INDUSTRY CONT

FOWL CLASSIFICATION CONT.

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION
A.L(4F.B.) Down	1. Pillows 2. Upholstery 10. Variously Classified
A.L(F.F.) Feather bone	1. Clothing
A.L. (4F.P.) Plumes	1. Millinery
A.L.(4 F.D.) Dairy Products	1. Canned (See A.L. (4 F.D.) Classification)
A.L.(4L.M.) Meat	1. Canned 2. Fresh 10. Variously Classified

A.I.(F.T.) 1. Clothing

A.I. ("F.T.) 1. Millinery

A.I.(" F.D.) 1. Canned
Dairy

(See A.I. (" F.D.)

A.I.("M.M.) 1. Canned
2. Fresh
10. Variously

CLASSIFICATION OF INDUSTRY CONT.

LIVE ANIMAL CLASSIFICATION

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION	DIVISION OF PLANT
A.L (2L.C.) COWS	1. Dairy Products	B. Powdered Milk E. Evaporated Milk I. Ice Cream M. Malted Milk S. Sugar of Milk X. Condensed Milk V. Variously Classified
A.L. (2L.H) Horses		
A.L. (2L.M.) Mules		
A.L.(2L.S.) Sheep	1. Wool	T. Textiles (See Textile Sheet under Plant Products)

LIVE ANIMAL CLASSIFICATION

CLASSIFICATION OF INDUSTRY CODE

CLASS OF INDUSTRY	CLASSIFICATION	DIVISION OF PLANT
A.L. (Sl.C.) Cows	I. Dairy Products	B. Powdered Milk E. Evaporated Milk I. Ice Cream M. Malted Milk S. Sugar of Milk X. Condensed Milk V. Variously Classified
A.L. (Sl.H) Horses		
A.L. (Sl.M.) Mules		
A.L.(Sl.S.) Sheep	I. Wool	T. Textiles (See Textile Sheet under Plant Products)

CLASSIFICATION OF INDUSTRY CONT.

LIVES STOCK CLASSIFICATION

DIVISION OF INDUSTRY	CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION
A.L. (2M) Meat	C. Cured D. Dried F. Fresh P. Packed S. Salted X. Pickled V. Variously C.assified	
	F. Fertilizer	
	G. Glycerin	1. Cosmetics 2. Medicine 3. Chemicals 10. Variously classified
	H. Hair	1. Matresses 2. Upholstery 3. Textiles 4. Brushes and Brooms
A.F.(20.) Oils and Other by-Products		10. Variously classified
	O. Oils and Fats	1. Lard and Substitutes 2. Butter and Substitutes 3. Oils 4. Fats 10. Variously classified
	V. Variously classified	

DIVISION OF INDUSTRY	CLASS OF INDUSTRY	
	C. Cured	
	J. Dried	
	F. Fresh	
	P. Packed	
A.F. (2%)	S. Salted	
	X. Pickled	
	V. Variously	
	W. Bottled	
	N. Fertilizer	
		1. Cosmetics
		2. Medicine
	A. Glycerin	3. Chemicals
		10. Variously classified
		1. Mattresses
		2. Upholstery
		3. Textiles
	H. Hair	4. Brushes and Brooms
		10. Variously
A.F.(20.) Oils and Other By-Products		classified
		1. Lard and Substitutes
		2. Butter and Substitutes
	O. Oils and Fats	3. Oils
		4. Soaps
		10. Variously classified
	V. Variously classified	

CLASSIFICATION OF INDUSTRY CONT.

INSECT CLASSIFICATION

TYPE OF INDUSTRY	DIVISION OF INDUSTRY	CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION
		B. Bees Wax	
	B. Bees	H. Honey	1. Comb
			2. Strained
			3. Variously Classified
		V. Variously Classified	
A.L.(5) Insects	L. Lac Beetle		1. Dyes
			2. Lacquer
		L. Lac	3. Sealing Wax
			4. Shellac
			5. Varnish
			6. Variously Classified
	S. Silk Worm		1. Textiles
			2. Thread
		S. Silk	3. Variously Classified

A.E.(5)
Insects

3. Silk Worm

V. Variously Classified

CLASSIFICATION OF INDUSTRY CONT.

PLANT PRODUCTS CLASSIFICATION

CLASS OF RAW MATERIALS	TYPE OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
A.P. Plant Products	1. Textiles	A.P.(1) (P.4A)
	2. Seeds	A.P.(2) (P.4B)
	3. Grain	A.P.(3) (P.4B)
	4. Vegetables	
	5. Berries	
	10. Variously Classified	

5. Berries

6. Vegetables

7. Cereals
Flour

TEXTILE CLASSIFICATION CONT.

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION
A.P.(1C.9) Knitters	1. Hosiery 2. Sweaters 3. Underwear 4. Glover and Mittens 5. Neck Ties 6. Mufflers 7. Jersey Cloth 8. Bathing Suits 10. Variously classified
A.P.(1S.2) Weavers	1. Broad 2. Narrow

1. Hosiery
2. Sweaters
3. Underwear
4. Gloves and Mittens
5. Neck Ties
6. Mufflers
7. Jersey Cloth
8. Bathing Suits
10. Variously
classified

1. Broad

2. Short

CLASSIFICATION OF INDUSTRY CONT.

TEXTILE CLASSIFICATION

TYPE OF INDUSTRY	DIVISION OF INDUSTRY	CLASS OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
A.P.(1) Textiles	C. Fine Cotton Spinning Mill	1. Bleaching and dyeing 2. Cotton Spinning Mill 3. Cotton Thread Mill 4. Weaving Mill 5. Weaving Mill 6. Wool Spun Cotton Mill 7. Cotton Spinning Mills into Heavier Count 8. Printing Patterns Mill	
	K. Knitting		A.P. (1C.9) (P.4A2)
	S. Silk	1. Silk Throwing 2. Weavers 10 Variously classified	A.P.(1F.2) (P.4A2)
	W. Wool	1. Cloth Mills Worsted and Woolen 2. Woolen Cloth Mills 3. Worsted Cloth Mills 4. Worsted Weaving Mills 5. Worsted Yarn Mills 6. Wool Yarn Mills 10. Variously Classified	

CLASSIFICATION OF INDUSTRY CONT.

P LANT PRODUCTS CLASSIFICATION

TYPE OF INDUSTRY	DIVISION OF INDUSTRY	CLASS OF INDUSTRY
A.P.(2) Seeds	A. Arbor and Nursery Plants F. Field Seed G. Garden Seed H. Horticulture or Flower Seed V. Variously Classified	
A.P.(3) Grain	B. Breakfast food F. Flour V. Variously Classified	B. Bakers'
A.P.(4) Vegetables	C. Canned D. Dried O. Oiled (Vegetable) P. Pickled R. Raw V. Variously Classified	
A.P.(5) Berries	C. Canned J. Jam and Preserves R. Raw V. Variously classified	

TYPE OF INDUSTRY	DIVISION OF INDUSTRY	CLASS OF INDUSTRY
	A. Arbor and	
	F. Field Seed	
A.T.(3) Seeds	H. Horticultural or Flower Seed	
	V. Variously Classified	
	D. Dressed food	
A.T.(2) Grain	V. Variously Classified	
	D. Dried	
	O. Oiled	
	(Vegetable)	
A.P.(4)	P. Pickled	
	V. Variously Classified	
	C. Canned	
	J. Jam and	
A.T.(5) Berries	R. Raw	
	V. Variously classified	

CLASSIFICATION OF INDUSTRY CONT.

FISHERIES CLASSIFICATION

CLASS OF RAW MATERIALS	SPECIAL NOTE
A.F. Sea and Other water Materials (fisheries)	We were promised this classification complete by the United States Department of Fisheries in Washington. We had the matter up with the Deputy Commissioner, but as yet we have received no classification. I would suggest that the Red Cross Institute follow this matter up, and get the classification they may have completed by this time.

FISHERIES CLASSIFICATION.

CLASS OF NEW MATERIALS

SPECIAL NOTE

A.J. Jim Hall
Order under
Materials
[illegible]

We have received this
classification complete by the
United States Department of
Fisheries in Washington. We had
the matter up with the Deputy
Commissioner, but as yet we have
received no classification. I
would suggest that the Red Cross
Institute follow this matter up,
and get the classification they
may have completed by this time.

CLASSIFICATION OF INDUSTRY CONT.

CARBON AND OIL CLASSIFICATION

CLASS OF RAW MATERIALS	TYPE OF INDUSTRY	DIVISION OF INDUSTRY
M.C. Carbons (natural)	1. Anthracite Coal	
	2. Bituminous Coal	1. Coke and Coal Gas 2. Coal Tar 3. Fuel 10. Variously Classified
	3. Graphite	1. Lubricants 2. Pencils 3. Crucibles 4. Variously Classified
M.O. Oils and Natural Gases	1. Crude Oils	
	2. Natural Gas	
	3. Refined oils	
	10. Variously Classified	

CLASSIFICATION OF INDUSTRY CODE.

CARBON AND OIL CLASSIFICATION

CLASS OF RAW	TYPE OF	DIVISION OF INDUSTRY
	1. Anthracite Coal	
	2. Bituminous Coal	1. Coke and Coal Gas
M.C. Carbons (natural)		2. Coal Tar 3. Fuel 10. Variously
	3. Graphite	1. Lubricants 2. Pencils 3. Crucibles [illegible]
	[illegible]	[illegible]
M.C. Oils and Natural Gases	[illegible]	
	3. Refined oils 10. Variously Classified	

CLASSIFICATION OF INDUSTRY CONT.

METAL CLASSIFICATION

CLASS OF RAW MATERIALS	TYPE OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
M.M. Metals	1. Alloy Metals	M.M.(1) (P.7A)
	2. Commercial Metals	M.M.(2) (P.7B)
	3. Precious Metals	M.M(3) (P·3C)

CLASSIFICATION OF INDUSTRY CONT

ALLOY CLASSIFICATION

TYPE OF INDUSTRY	DIVISION OF INDUSTRY	CLASS OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
M.M.(1) Alloy Metal	1. Iron Alloy	1. Nickel	M.M.(1) (p.7A1)
		2. Venadium	
		3. Tungsten	
		4. Manganese	
		5. Chromium	
	S. Soft Metal Alloys	1. Babbitt Metal	
		2. Type Metal	
		3. Solder	
		4. Woods Metal	

	1. Nickel	N.M.(1) (p.VAI)
	2. Tungsten	
	3. Chromium	
1. Iron Alloy		
	4. Manganese	
	5. Cobalt	
N.M.(1) Alloy Metal		
	1. Babbitt Metal	
	2. Type Metal	
3. Soft Monel Alloys	3. Solder	
	4. Woods Metal	

CLASSIFICATION OF INDUSTRY CONT.

NICKEL CLASSIFICATION

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION	DIVISION OF PLANT
		E. Electrical Appliances
M.M.(II.1) Nickel	S. Special Nickel Alloys	A. Automobile Alloys

CLASSIFICATION OF INDUSTRY CONT.

PRECIOUS METALS CLASSIFICATION

TYPE OF INDUSTRY	DIVISION OF INDUSTRY	CLASS OF INDUSTRY
	G. Gold and Related Metals	1. Coins 2. Dental Supplies 3. Jewelry 4. Surgical Instruments 10. Variously classified
M.M.(3) Precious Metals	P. Platinum and Related metals	1. Electrical Industry 2. Fountain Pens 3. Jewelry 4. Medical Instruments 10. Variously classified
	V. Variously classified	

V. Variously
classified

Cont. from - -

CLASSIFICATION OF INDUSTRY CONT.

METAL CLASSIFICATION CONT.

TYPE OF INDUSTRY	DIVISION OF INDUSTRY	CLASS OF INDUSTRY	FOR FURTHER CLASSIFICATION SEE PAGE
M.M.(2) Commercial Metals	E. Metals	1. Iron	
		2. Tin	
		3. Lead	
		4. Zinc	
		5. Aluminum	
		6. Copper	
		10. Variously Classified	M.M.(2P.6) (P.7B1)
	P. Products and Machinery	1. Piping Trades	M.M.(2P.L) (P.7B2)
		2. Service Machinery	M.M.(2p.2) (p.7b3)
		3. Electrical	M.M. 2p.3) (p.7b5) (M.M.2p.4)
		4. Construction Mining and Tools	(p.7b5) (M.M.2p.5)
		5. Vehicles	(p.7b6) (M.M.2p.6)
		6. Agricultural	(p.7b7) (M.M.2P.7)
		7. Manufacturing	(p.7b8) (M.M.2P.8)
		8. Engines, Motors and Locomotives	(p.7b9)
		10. Variously Classified	
	S. Services Rendered	1. Foundry	(M.M.2b1) (p.7b10)
		2. Structural	(M.M. 2S.2) (p.7b11)
		M. Machine supplies general	(M.M.2S.3) (p. 7b12)
		10. Variously classified	(M.M.2S.4) (P. 7b13)

		1. Iron	
		2. Tin	
		3. Lead	
	4. Metals	4. Zinc	
		5. Aluminum	
		6. Copper	
		10. Variously Classified	M.M. (2E.6) (P.7B1)
		1. Piping Trades	M.M. (2P.1)
		2. Service	M.M. 2P.2
			M.M. 2P.3
	3. Products and Materials	3. Electrical	P.7B5
		4. Construction Mining and Tools	P.7B5
			M.M.2P.5
		5. Vehicles	P.7B6
		6. Agricultural	P.7B7
M.M.(2) Commercial Service			M.M. 2P.7
		8. Engines, Motors and Locomotives	P.7B9
		10. Variously Classified	
	5. Services Rendered	1. Foundry	M.M. 2B1 P.7B10
		2. Structural	P.7B11
		4. Machine supplies	M.M. 2B.3 P. 7B12
		10. Variously classified	M.M. 2B.4 P. 7B13

CLASSIFICATION OF INDUSTRY CONT.

METAL CLASSIFICATION CONT.

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION
M.M.(2E.3) Lead	P. Pig Lead V. Variously classified
M.M.(2M.6) Copper	S. Sheet Copper R. Rods T. Tools W. Wire V Variously Classified

5. Sheet copper
R. Rods
T. Coils
W. Wire
V. Variously classified

CLASSIFICATION OF INDUSTRY CONT.

SERVICE MACHINERY CLASSIFICATION CONT.

TYPE OF INDUSTRY	SPECIFIC CLASSIFICATION	DIVISION OF PLANT
		1. Computing and Billing Machine
		2. Weighing and Recording Machines
	0. Office Devices	3. Multigraphs
		4. Marking Machines and Experimental Machinery
		5. Stencil Machines
		6. Typewriters
		7. Addressographs

0. Office Devices

1. Computing and
2. Weighing and Recording Machines
3. Multigraphs
4. Merkle Machines and
5. Stencil Machines
6. Typewriters
7.

CLASSIFICATION OF INDUSTRY CONT.

PIPING TRADES CLASSIFICATION

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION	DIVISION OF PLANT
	H. Heating and Ventilating	1. Stoves and Fittings (oil and Gas) 2. Boilers 3. Boilers, Tanks, and General Boiler repairs 4. Ventilating 5. Heating, drying and Vacuum cleaning 6. Blowers, positive and rotary 7. Flanged Fittings and Steam Specialties 10. Variously classified
M.M.(2P.1) Piping Trades	L. Pumping	1. Pumping Machines 2. Pumps 3. Oil and gas well supplies 1p. variously classified
	N. Engines and Boiler Fittings	1. Lubricators 1p. Variously classified
	P. Plumbing	1. Pipes, Water Works supplies, hydrants 2. Automatic specialties, tanks, etc. 3. Fire apparaturs, Extinguishers, automatic sprinklers 4. Valves, Hydraulic Machinery 5. Water, Gas and plumbing Goods 6. Finished plumbing 7. Fixtures 10. Variously classified
	R. Refrigerating Machinery V. Variously Classified	1. Refrigerating Machinery 2. Ice Making Machinery

PIPING TRADES CLASSIFICATION

		DIVISION OF PLANT
		1. Stoves and Fittings (oil and Gas)
		2. Boilers
		3. Boilers, Tanks, and General Boiler Repairs
	H. Heating and Ventilating	4. Ventilating
		5. Heating, drying and Ventilating machinery
		6. Blowers, positive and rotary
		7. Flanged Fittings and Steam Specialties
		10. Variously classified
M.M.(SP.I)		
		1. Pumping Machines,
		2. Pumps
		3. Oil and Gas well supplies
		10. Variously classified
	H. Engines and	1. Locomotive
		10. Variously classified
		1. Pipes, Water Works supplies, Hydrants
	9. Plumbing	2. Automatic sprinklers, vents, etc.
		3. Fire appearers, Extinguishers, automatic sprinklers
		4. Valves, Hydraulic Machinery
		5. Water, Gas and plumbing Goods
		6. Finished plumbing
		7. Fixtures
		10. Variously classified
	H. Refrigerating	1. Refrigerating Machinery
	V. Variously Classified	2. Ice Making Machinery

CLASSIFICATION OF INDUSTRY CONT.

SERVICE MACHINERY CLASSIFICATION

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION	DIVISION OF PLANT
	D. Dairy (Milk) Machinery	1. Fishing Reels 10. Variously classified
M.M.(2P.1) Service Machinery	F. Furniture	1. Brass and metal beds 2. Pressed Steel school desks 3. Steel filing devices and lockers 4. Safes and Vaults 5. Barbers' Chairs and Barbers' fixtures 6. Metal furniture and supplies 10. Variously classified
	M. Musical Instruments	1. Phonographs 2. Player Pianos 3. Pianos 4. Wind Instruments 10. Variously classified
	P. Power Transmission Chains and Sprockets	1. Power Transmission 2. Chains and Sprockets 3. Devices for transmission of power 10. Variously classified

CLASSIFICATION OF INDUSTRY CODE.

CLASS OF INDUSTRY	DIVISION OF PLANT
	1. Lighting Units
	2. Heavy (Mill) Machinery
	19. Variously classified
	1. Brass and metal beds
	2. Pressed Steel school desks
	3. Steel filing devices and lockers
K.V.(3).1) Service Industry	4. Furniture
	4. Safes and Vaults
	4. Barbers' Chairs and Barbers' fixtures
	4. Metal furniture and supplies
	4. Variously classified
	1. Phonographs
	2. Player pianos
Instruments	3. Pianos
	4. Wind instruments
	10. Variously classified
	1. Power Transmission
P. Power Transmission Chains and Sprockets	2. Chains and Sprockets
	3. Devices for transmission of power
	10. Variously classified

CLASSIFICATION OF INDUSTRY CONT.

ELECTRIC CLASSIFICATION

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION	DIVISION OF PLANT
	E. Electric Motors and Generators	
	H. Hoists and Elevators	
	I. Insulating Machinery	
M.M.(2P.3) Electrical	L. Lighting.	1. Fixtures for Lighting 2. Starting, Lighting, and Ignition 3. Magnetos and Ignition Devices 4. Motor Cycle Lamps 10. Variously classified
	P. Panel Boards, Switch Boards, Gas and Electric Fixtures	
	T. Tools	1. Electric Welding 2. Electric Tools 3. Variously Classified
	W. Water Power Machinery	
	X. X-Ray Machinery	
	V. Variously Classified	

DIVISION OF PLANT

CLASSIFICATION OF INDUSTRY CONT.

VEHICLE CLASSIFICATION

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION	DIVISION OF PLANT	FOR FURTHER CLASSIFICATION SEE PAGE
M.M.(2P.5) Vehicles	A. Automobiles and Accessories	1. Autos, Auto parts and specialties 2. headlights 3. Trailers 4. Trucks 5. Auto Chasis 10. Variously classified	
	B. Boats and Ships		M.M.(2P.5B) (P.7B6B)
	C. Cars		M.M.(2B.5C) (P.7B6C)
	H. Horse Drawn Vehicles	1. Carriages 2. Carriage Hardware 3. Sleds and Sleighs 10. Variously Classified	
	L. Locomotives		M.M.(2P.5L) (P.7B6E)
	S. Seaplanes and Aeroplanes		
	W. Wheel Barrows and Hand Trucks		
	V. Variously Classified		

CLASS OF INVENTION	CLASSIFICATION	DIVISION OF CLASS	NOT EXAMINED SEE PAGE
V.M.(2P.5) Vehicles	A. Automobiles and Accessories	1. Autos, Auto parts and specialties 2. Headlights 3. Trailers 4. Trucks 5. Auto Chasis 10. Variously classified	
	B. Boats and Ships		
	C. Cars		M.K.(2P.5C)
	H. Horse Drawn Vehicles	1. Carriages 2. Carriage Hardware 3. Sleds and Sleighs 10. Variously Classified	
	L. Locomotives		M.K.(2P.5L)
	S. Seaplanes and Aeroplanes		
	W. Wheel Barrows and Hand Trucks		
	Y. Variously Classified		

CLASSIFICATION OF INDSUTRY CONT.

VEHICLE CLASSIFICATION CONT.

SPECIFIC CLASSIFICATION	DIVISION OF PLANT	FOR FURTHER CLASSIFICATION SEE PAGE
M.M.(2P.5B) Boats and Ships	1. Steel Ships 2. Ship Building 3. Ship repairing 4. Machinery for Ships 5. Yacht Boats & Accessories 6. Gasoline Yachts and Engines 10. Variously Classified	
M.M.(2P.5C.) Cars	1. Steel Freight Cars 2. Steel and Wood or Composit Freight Cars 3. Passenger Steam Cars 4. Electric Cars 5. Passenger Car Accessories 6. Freight car accessories 10. Variously Classified	M.M.(2P.5B.5) P.&B6B) M.M.(2P.5B.6) (P.7B6B)

SPECIFIC	DIVISION OF	FOR FURTHER CLASSIFICATION
		1. Steel Ships 2. Ship Building 3. Ship repairing 4. Machinery for Ships 5. Yacht Boats & Accessories 6. Gasoline Yachts and Engines 10. Variously Classified
M.M.(2P.5B) Boats and Ships		
		1. Steel Freight Cars 2. Steel and Wood or Composit Freight Cars 3. Passenger Steam Cars 4. Electric Cars
M.M.(2P.5C.) Cars		
	5. Passenger Car Accessories 6. Freight car accessories 10. Variously Classified	M.M.(2P.5B.5) T.M(5B) M.M.(2P.5B.6) (T.Y&S)

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VEHICLE CLASSIFICATION CONT.

PLANT DIVISION	PLANT SUBDIVISION
M.M.(2P.5C.5) Freight Car Accessories	A. Air Brakes B. Bolsters C. Couplers D. Car Lines E. Steel Ends F. Floors and Floor Fixtures G. Gears and Shafts H. Hand Brakes J. Journal Boxes K. Brake Beams L. Ladders M. Side Bearings N. Nournal Brasses O. Abrasive Castings P. Fenders R. Roofs S. Steals for Floors T. Safety Treads U. Flust Guards W. Wheels (Cast iron, cast steel, rolled steel, etc.) V. Variously classified
M.M.(2P.5C.) Passenger Car Accessories	B. Baggage, mail, and express letter cases C. Curtains and Curtain Fixtures D. Diaphragms for Vestibules E. Electric Lighting Apparatus H. Heating apparatus I. Interior Mouldings L. Lavatories M. Mounted or Signal Lamps O. Openings for Vestibule doors R. Ruffers and Platforms S. Safety treads W. Windows and Fixtures V. Variously classified

VEHICLE CLASSIFICATION CODE.

	A. Air Brakes
	B. Bolsters
	C. Couplers
	D. Car Lines
	E. Steel Ends
	F. Floors and Minor Fixtures
M.C.B.(SP.50.5)	G. Gears and Shafts
Freight Car	H. Hand Brakes
Accessories	J. Journal Boxes
	K. Brake Beam
	L. Ladders
	M. Side Bearings
	N. Roofing Brands
	O. Abrasive Castings
	P. Vendors
	R. Seals
	S. Steels for Floors
	T. Safety Treads
	U. Plant Guards
	W. Wheels (Cast iron, cast steel, rolled steel, etc.)
	V. Variously classified

	B. Baggage, mail, and express cars
	C. Couplers and Draw Timbers
	D. Diaphragms for Vestibules
	E. Electric lighting apparatus
	K. Heating apparatus
	L. Interior Lighting
	P. Lavatories
M.C.(SP.50.)	M. Mounted or Signal Lamps
Passenger Car	O. Openings for Vestibule doors
Accessories	R. Buffers and Platforms
	S. Safety treads
	W. Windows and Fixtures
	V. Variously classified

CLASSIFICATION OF INDUSTRY CONT.

AGRICULTURAL IMPLEMENT CLASSIFICATION

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION	DIVISION OF PLANT
	A. Corn Huskers and Shredders	
	B. Binder Twine	
	C. Cream separators	
	D. Grain elevators and Wagon Dumps	
	E. Ensilage Machinery & Silo Fillers	
	F. Fruit Spraying Machinery	
	G. Garden Tools	
	H. Harvester Machinery	
		1. Corn Shellers
		2. Feed Mills and Grinders
	J. Corn Machinery Preparation and Production	3. Variously classified
M.M.(2B.6) Agricultural Implements		1. Gasolene
	K. Kerosene and Gasolene Engines	2. Kerosene
	L. Hay and Ba iling Presses	
	M. Milking Machinery	
	N. Windmills and Pumps	
	O. Potato Machinery	
	P. Plows and Tillage Implements	
	Q. Manure Spreaders	
	R. Scales	
	S. Silos	
	T. Tractors and Threshers	
	U. Cotton Gins	
	W. Wagons	
	X. Sugar Cand and Cider Mills	
		1. Dairy barn equipment
	Y. Yard and Barn Equipment	2. Barn hay tool equipment
		3. variously classified
	Z. Grain Drills & Seeding machinery	
	V. Variously classified	

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION	DIVISION OF PLANT
	A. Corn Huskers and Shredders	
	B. Planter Units	
	C. Grain separators	
	D. Grain elevators and Conveyors	
	E. Ensilage Machinery & Silo Fillers	
	F. Fruit & Drying Machinery	
	G. Garden Tools	
	H. Harvester Machinery	
	I. Corn Shellers	
	J. Corn Handling Equipment and Production	1. Feed Mills and Grinders 2. Poultry classified
M.M.(2B.6)		1. Gasolene
Agricultural Implements	K. Kerosene and Gasolene Engines	2. Kerosene
	L. Hay and Ba iling Presses	
	M. Milking Machinery	
	N. Windmills and Pumps	
	O. Potato Machinery	
	P. Plows and Tillage Implements	
	Q. Harrow Sprocators	
	R. Seeders	
	S. Cribs	
	T. Tractors and Threshers	
	U. Cotton Gins	
	V. Wagons	
	W. Sugar Cane and Cider Mills	
	X. Yard and Barn Equipment	1. Dairy barn equipment 2. Barn hay tool equipment
	Y. Grain Drills & Seeding machinery	3. Variously classified
	Z. Variously classified	

CLASSIFICATION OF INDUSTRY CONT.

CONSTRUCTION AND MINING CLASSIFICATION

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION	DIVISION OF PLANT
	C. Construction	1. Hoisting Machinery with adjuncts including boilers 2. Cranes, hoists, bridge builders, etc. 3. Fabrication andErection of Bridges, building for river craft 4. Fabrications, ship steel, machinery and miscellaneous 5. Structural machinery 6. Structural shakes 7. Mill construction 8. Conveying machinery 10. Variously classified
M.M.(2P.4) Construction, Mining Machinery & Tools	M. Mining and Excavating	1. Hydraulic dredges, dump cars, Dryers, etc. 2. Mining Machinery and Fixtures 3. Drilling Machines 4. Excavating Machinery 5. Mining, Quarrying, Crushing, Engineering Machinery 6. Coal Mine Equipment, Clay Crushers 7. Steam Shovels 10. Variously classified
	V. Variously Classified	

V. Variously
Classified

CLASSIFICATION OF INDUSTRY CONT.

MANUFACTURING MACHINERY CLASSIFICATION

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION	FOR FURTHER CLASSIFICATION SEE PAGE
	B. Brick Making and other Soil Working Machinery	M.M.(2P.6B.) (P.7B8A)
	C. Textiles	M.M.(2P.7C.) (P.7B8B)
	D. Machine Driven tools	M.M.(2P.7D) (P.7B8D)
M.M.(2P.7) Manufacturing Machinery	F. Food Processing	M.M.(2P.7F) (P.7B8C)
	M. Metal Working	M.M.(2P.7M) (P.7B8E)
	P. Paper and Pulp	M.M.(2P.7p) (p. 7B8G)
	S. Small Tools	M.M.(2P.7S) (P.7B8H)
	T. Threading and Plumbing machinery	
	W. Wood Working Machinery	
	W. Wood Working Machinery Variously classified	M.M.(2P.7W) (P.7B8K)

Machinery	M. Wood Working	M.M.(ZP.7M)	(P.7B8M)
	P. Paper and Pulp	M.M.(ZP.7P)	(P. 7B8G)
	S. Small Tools	M.M.(ZP.7S)	(P.7B8H)
	W. Wood Working	M.M.(ZP.7W)	(P.7B8K)
M.M.(ZP.Z)	F. Food Pro-		
	Driven tools	M.M.(ZP.7D)	(P.7B8D)
	Machinery	M.M.(ZP.6B.)	(P.7B6A)
	and other Soil Working		

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MANUFACTURING MACHINERY CLASSIFICATION CONT.

SPECIFIC CLASSIFICATION	DIVISION OF PLANT
M.M.(2P.7P) Soil Working Machinery	1. Brick Presses and Special Machinery 2. Glass Making Machinery 3. Stone Working Machinery 4. Machines and Appliances for Making all classes of clay products, brick, tile, sewer papes, paving blocks, roofing, and floor tile 5. Crushers and Pulverizers 10. Variously classified
M.M.(2P.7C) Clothing and Textile Macninery	1. Cotton and Wool machinery and Feeders for Same 2. Looms 3. Sewing Machines 4. Spinning and Twisting Machinery 5. Knitting Mills 6. Textile and Finishing Machinery 7. Weavers, Shuttles, and Shuttle Irons 8. Textile and Printing Machinery 9. Shoe Machinery 10. Variously classified

DIVISION OF PLANT

	1. Brick Presses and
	Special Machinery
	3. Stone Working Machinery
	4. Machines and Appliances
M.M.(ZP.YP)	for Making all classes of
Soil Working	clay products, brick, tile, sewer pipes,
Machinery	paving blocks, roofing, and
	floor tile
	5. Crushers and Pulverizers
	10. Variously classified

	1. Cotton and Wool machinery
	and Feeders for Same
	[illegible]
	3. Sewing Machines
	4. Spinning and Twisting
	[illegible]ery
	[illegible] Mills
M.M.(ZP.YC)	6. Textile and Finishing
Clothing and	Machinery
Textile Machinery	7. Weavers, Shuttles, and
	[illegible] Items
	8. Textile and Printing
	[illegible]ery
	9. Shoe Machinery
	10. Variously classified

CLASSIFICATION OF INDUSTRY CONT.

MANUFACTURING MACHINERY CLASSIFICATION CONT.

SPECIFIC CLASSIFICATION	DIVISION OF PLANT
M.M.(2P.7D) Machine driven tools	1. Milling Cutters, hobs, and special tools 2. Punchers, pulleys, hangers, and shaftings 3. Hob saws and Machine tools 4. Power saws 5. Power Hammers 6. Machine and Mechanical Goods 8. Screw Machinery 9. Bullcozers 10. Braiders 11. Wire Machinery 12. Lathe, Crane, and Shaper 13. Drill Presses, Drill Chucks 14. Stands for Emery Wheels and Grinding Machinery 15. Machine Racks and Keys 16. Taps, Stocks, Dies, Punch Presses, Jigs, Special Machinery 17. Arbor, Power, and Other presses 18. Acetylene Generators and appliances 19. Engine Lathes 20. Polishing Engines 21. Boring Mills 22. Grinders 30. Variously classified
M.M.(2P.7F) Food Processing machinery	1. Bakers' Machinery 2. Packing House Machinery 3. Flour Mill Machinery 4. Milling Machinery and General Machinery 5. Sugar Machinery 6. Chocolate, Paint, Printing and Ink Machinery 7. Oil and Mill Machinery 8. Cigar and Cigarette Machinery 10. Variously classified

CLASSIFICATION

M.M. (ZP.7D)
tools

1. Milling Cutters, Hobs, and
special tools
2. Punchers, pulleys,
hangers, and shafting
3. Hob saws and Machine
tools
4. Power Hammers
5. Power Hammers
6. Riveting and Boilermaker
Tools
7. Screw Machinery
8. Bulldozers
9. Bulldozers
10. Dredgers
11. Wire Machinery
12. Lathe, Crane, and
Shaper
13. Drill Presses,
Drill Chucks
14. Stands for Emery Wheels
and Grinding Machinery
15. Machine Racks and Keys
16. Taps, Stocks, Dies,
Punch Presses, Jigs,
Special Machinery
17. Lapur, Paper, and Other
Presses
18. Acetylene Generators
and Appliances
19. Bending Rollers
20. Planing Machine
21. Boring Mills
22. Grinders
30. Variously classified

M.M. (ZP.7D)
Food Processing machinery

1. Packers' Machinery
2. Packing House Machinery
3. Flour Mill Machinery
4. Milling Machinery and
General Machinery
5. Sugar Machinery
6. Chocolate, Paint,
Printing and Ink Machinery
7. Oil and Mill Machinery
8. Cigar and Cigarette
Machinery
10. Variously classified

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CLASSIFICATION OF INDUSTRY CONT.

MANUFACTURING MACHINERY CLASSIFICATION CONT.

SPECIFIC CLASSIFICATION	DIVISION OF PLANT
M.M.(2P.7M) Metal Working Machinery	1. Tin working machinery 2. Wire working machinery 3. Metal planing machinery 4. Moulding machinery and pressing machinery 5. Railroad machinery 6. Tools and special metal working machinery 7. Sheet metal working machinery 8. Heavy milling machinery 9. Gear Cutting machinery 10. Collanders and heavy milling machinery 11. Rolling mill machinery and Presses 12. Grinding and Polishing Machinery 13. Trucking and Drawing Machinery 20. Variously classified
M.M.(2P.7P) Paper and Pulp Machinery	1. Envelope machinery 2. Pulp machinery 3. Printing Machinery 4. Water wheels and paper machinery 10. Variously classified

DIVISION OF PLANT

M.M.(ZP.ZM)

1. Tin working machinery
2. Wire working machinery
3. Metal planing machinery
4. Moulding machinery
   and pressing machinery
5. Railroad machinery
6. Tools and special metal
   working machinery
7. Sheet metal working machinery
8. Heavy milling machinery
9. Gear Cutting machinery
10. Collenders and heavy
    milling machinery
11. Rolling mill machinery and
    presses
12. Grinding and Polishing
    machinery
13. Trueing and Drawing
    machinery
20. Variously classified

M.M.(ZP.ZP)
Paper and Pulp
Machinery

1. Dry Paper machinery
2. Pulp machinery
3. Printing Machinery
4. Water wheels and paper
   machinery
10. Variously classified

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CLASSIFICATION OF INDUSTRY CONT.

MANUFACTURING MACHINERY CLASSIFICATION CONT.

SPECIFIC CLASSIFICATION	DIVISION OF PLANT
M.M.(2B.S.) Small Tools	1. Dies, punch presses, Jigs, special machinery 2. Axes and Hatchets 3. Hand Saws 4. Patent Pliers 5. Nippers, Punches, and Tools 6. Punches, Shears and Tools 7. Wrenches 8. Anvils and Forgings and Tools 9. Chucks, Taps, etc. 10 Gauges 11. Variously Classified
M.M.(2P.7T) Threading and Other plumbing machinery	1. Pipe Threading and Cutting Machinery
M.M.(2P.7W) Wood Working Machinery	1. Barrel Machinery 2. Roofing and Wall Board Machinery 3. Shingles, Headings, and Stairs 4. Saw and Planing Mill Machinery 5. Wood Working Machinery 6. Counter Making Machinery 7. Variously Classified

	DIVISION OF PLANT
M.M.(2B.S.) Small Tools	1. Dies, punch presses, jigs, special machinery 2. Axes and Hatchets 3. Hand Saws 4. Pocket Files 5. Nippers, Pincers, and Tools 6. Punches, Snears and [illegible] 7. [illegible] 8. Anvils and Forgings and Tools 9. [illegible], Taps, etc. 10 Gauges 11. [illegible] [illegible]
M.M.(2B.7E) Threading and [illegible] ing machinery	1. Pipe Threading and Cutting Machinery
M.M.(2B.7W) Wood Working Machinery	1. Barrel Machinery 2. Roofing and Wall Board Machinery 3. Mullions, Muntins, and Stairs 4. Saw and Planing Mill Machinery 5. Wood Working Machinery 6. Counter Making Machinery 7. Variously Classified

CLASSIFICATION OF INDUSTRY CONT.

ENGINE AND LOCOMOTIVE CLASSIFICATION

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION	DIVISION OF PLANT	FOR FURTHER CLASSIFICATION SEE PAGE
	E. Electric Motors& Locomotives	1. Electric Locomotive Accessories 2. Motors & Motor Parts 3. Electric Locomotives 10. Variously Classified	
M.M.(2P.9) Engines Motors and locomotives	G. Gasoline Locomotives	1. Gas & Gasoline Engines	
	L. Locomotives	1. Standard Gauge Locomotives 2. Narrow Gauge Locomotives 3. Locomotive Accessories	M.M.(2P.9L3) 7B9A
	S. Stationary Engines	1. Hydraulic Turbines 2. Steam Turbines 3. Gas & Gasoline Engines 4. Oil Engines 5. Boilers 10. Variously Classified	

CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION	DIVISION OF PLANT	FOR FURTHER
		1. Electric Locomotive	
	1. Electric Motors & Locomotives	2. Motors & Motor Cars	
		3. Electric Locomotives	
		10. Variously Classified	
M.M.(ZP.9) Engines Motors and Locomotives	1. Gasoline Locomotives	1. Gas & Gasoline Engines	
	1. Locomotives	1. Standard Gauge Locomotives 2. Narrow Gauge Locomotives 3. Locomotive Accessories	M.M.(ZP.9P3) YP9A
	5. Electric Engines	1. Hydraulic Turbines 2. Steam Turbines 3. Gas & Gasoline Engines 4. Oil Engines 5. Boilers 10. Variously Classified	

CLASSIFICATION OF INDUSTRY CONT.

SERVICES RENDERED CLASSIFICATION

DIVISION OF INDUSTRY	CLASS OF INDUSTRY	SPECIFIC CLASSIFICATION
M.M.(2S) Services Rendered	1. Foundries	B. Brass Foundry and Machines G. Grey Iron Foundries M. Mill Foundries P. Pig Iron S. Steel Foundries V. Variously Classified
	2. Structural Parts	D. Dry Docking and General repairs O. Ornamental Iron works S. Structural Machine Parts T. Track Equipment V. Variously Classified
	3. Machine Shop	A. Aluminum Castings Brass Goods, Brass, Bronze, etc. B. Bolts, Nuts, Rivets, Screws, Nails, and metal goods C. Cutting Dies D. Die Shapes (pressed metal) F. Fancy metal goods brass and copped G. Gears, Gear Cutting and Worm Gears J. Jobbing Machine works and blacksmithing L. Lathes and Other spindle makers M. Metal stamping, perforated metal. R. Round ball bearings S. Sheet metal works W. Wood and Metal patterns V. Variously classified
	10. Variously classified	

		B. Brass Foundry and Machines
		C. Grey Iron Foundries
		D. Malleable Foundries
		E. Pig Iron
	A. Foundries	1. Steel Foundries
		2. Vertically Classified

CLASSIFICATION OF INDUSTRY CONT.

LOCOMOTIVE ACCESSORIES CLASSIFICATION

DIVISION OF PLANT	CLASS OF PLANT
M.M.(2P.9L.3) Locomotive Accessories	-1- Boiler Bolts
	-2- Fire Doors
	-3- Boiler Lagging
	-4- Fire Bricks
	-5- Throttle Valves
	-6- Blow off Cocks
	-7- Safety Valves
	-8- Superheaters
	-9- Grates
	-10- Ash pans
	-11- Stokers
	-12. Bypads and release valves
	-13. Valve Ears
	-14. Piston rod packing
	-15. Springs
	-16. Engine Trucks
	-17. Frames
	-18. Axles
	-19. Couplers
	-20. Water Gauges
	-21. Steam Gauges
	-22. Air Gauges
	-23. Speed Recorders
	-24. Steam Heating Apparatus
	-25. Lubricators, Hydrostatic and Force Speed Injectors
	-26. Air Brakes
	-27. Sanders
	-28. Bells
	-29. Bell Ringers
	-30. Whistles
	-31. Headlights
	-32. Renders and Accessories
	-33. Tender Tanks
	-34. Tender Underframes
	-35. Tender Trucks
	-36. Water Hose
	-40. Variously Classified

N.M.(2P.9L.3)
Locomotive
Accessories

-10- Ash pans
-11- Stokers.
-12. Pipes and release valves
-13. Valve Gears
-14. Piston rod packing
-15. Rings
-16. Engine Trucks
-17. Frames
-18. Axles
-19. Couplers
-20. Water Gauges
-21. Steam Gauges
-22. Air Gauges
-23. Speed Log Tubes
-24. Steam Heating Apparatus
-25. Lubricators, Hydrostatic and
Force Feed Lubricators
-26. Air Brakes
-27. Injectors
-28. Bells
-29. Bell Ringers
-30. Whistles
-31. Headlights
-32. Renders and Accessories
-33. Under Frame
-34. Render Connections
-35. Render Trucks
-36. Water Hose
-40. Various, Classified

CLASSIFICATION OF INDUSTRY CONT.

ROCK AND SOIL CLASSIFICATION

CLASS OF RAW MATERIALS	TYPE OF INDUSTRY
M.R. Rocks and Soils	B. Brick and Other Clays
	C. Construction Stones
	K. Chalk
	L. Slate
	M. Mica
	P. Precious Stones
	Q. Quartz
	S. Sand
	V. Variously Classified

B. Brick and Other Clays

K. Chalk

L. Slate

P. Precious Stones

T. Variously
Classified

CLASSIFICATION OF INDUSTRY CONT.

MINERAL SALTS CLASSIFICATION

CLASS OF RAW MATERIALS	TYPE OF INDUSTRY
	A. Alkali Salts
M.S. Salts (Mineral)	E. Earth Alkaline Salts
	R. Remaining Salts
	V. Variously classified

CLASSIFICATION OF INDUSTRY CONT.

LEGAL CLASSIFICATION

CLASS OF RAW MATERIALS	TYPE OF INDUSTRY
S.L.Legal	Not Yet classified

CLASSIFICATION OF INDUSTRY CONT.

MEDICAL CLASSIFICATION

CLASS OF RAW MATERIALS	TYPE OF INDUSTRY
S.M.Medical	Not yet Classified

CLASSIFICATION OF INDUSTRY

CONTINUATION SHEET

These notations apply to all subdivisions on the remaining sheets.

Work Performed

G. Growth, or Harvesting

P. Preparation

M. Manufacture

D. Distribution

U. Ultimate Consumer

V. Variously Classified

Type of information

P. Publications

A. Associations

L. Lists

S. Surveys

V. Variously classified

P. Preparation	A. Associations
	B. Dramatizations or Narrating
T. Tabulation	L. Lists
D. Distribution	S. Surveys
C. Classified	V. Variously classified

APPENDIX B

FORM OF SURVEY
OF OCCUPATIONAL POSSIBILITIES FOR THE MILITARY BLIND

City_____

Red Cross Institute for the Blind,
Baltimore, Maryland Date_____

Dear Sirs:

1. I wish to submit the following survey of the

_____ plant at _____

main plant
City_____State_____ which is the a branch

If a branch, give address of main office, if main plant, give names and addresses of branches.

2. In making this investigation, I interviewed the following men :
Name Position

3. My name and position is:

4. This plant manufactures the following materials and products:

seasonal
5. The work in this plant is full time, for the following reasons:

Add a paper immediately back of this sheet if you have not sufficient space.

Red Cross Institute for the Blind,
Baltimore, Maryland Date _____

Dear Sirs:

I. I wish to submit the following survey of the

_____ plant at _____

City _____ State _____ which is the a branch
main plant

If a branch, list address of main writing, if main plant, give names and addresses of branches.

2. In making this investigation, I interviewed the following men :
Name Position

3. My name and position is:

4. This plant manufactures the following materials and products:

5. The wood in this plant is foil from. For the following purposes:
assigned

Add a paper immediately back of this sheet if you have not sufficient space.

6. The market for this material is domestic. If foreign, the foreign market is specifically what?
The extent of each market is as follows:

7. Following are the raw products for this plant, where obtained, the character of supply-steady or uncertain-and reasons:

8. Men employed in this country in this industry approximately (If investigator is unable to answer this question, refer it to the Statistical Department, which will obtain the data from the U.S. Census Reports.)

9. If possible make an organization chart of this plant, which you can obtain by interview. Denote on this chart the names of the men in each position (if practicable). Be sure to cover the following points in your chart:

(a) Who is the Industrial Engineer (or man in equivalent capacity) of this plant? What training has he had?

(b) Who is the Superintendent of the plant? What type of man is he?

(c) How are the foremen usually selected in this plant? What type of foremen are found here? (1) The driving type, or (2) the persuasive type?

(d) What facilities has the plant at the present time for instructing its employees? What instruction is now being given? What plans are under way for the instruction of employees in this plant?

(e) To what extent has the experimental department of this plant been developed?

(f) Has the plant a planning room ? If so, who is the head of the planning room?

(g) Has the plant a balance of stores record?

(h) What method is used to keep track of piece work?

(i) What is the method of time keeping?

6. The market for this material is domestic. If foreign, the
finish

market is specifically what?
The extent of each market is as follows:

7. Following are the raw products for this plant, where obtained,
the character of supply-steady or uncertain-and reasons:

8. Men employed in this country in this industry approximately
(If insufficient, it would be useful if you could write to
the Statistical Department, which will obtain the data from the U.S.
Census Bureau.)

9. If possible make an organization chart of this plant, which
you can obtain by interview. Denote on this chart the names of
the men in each position (if practicable). Be sure to cover the
following points in your chart:

(a) Who is the Industrial Engineer (or man in equivalent
capacity) or this plant? What training has he had?

(b) Who is the Superintendent of the plant? What type of
man is he?

(c) How are the foremen usually selected in this plant?
What type of foremen are found here? (1) The driving type, or
(2) the persuasive type?

(d) What facilities has the plant at the present time for
instructing its employees? What instruction is now being giv n?
What plans are under way for the instruction of employees in
this plant?

(e) To what extent has the experimental department of this
plant been developed?

(f) Has the plant a planning room ? If no, who is the head
of the planning room?

(g) Has the plant a balance of stores record?

(h) What method is used to keep track of piece work?

(i) What is the method of time keeping?

(j) If possible, supply a routing chart, showing how the materials travel from machine to machine and note on this routing chart the places you think a blind employee could work.

10. Institutions in the vicinity for the blind, which are interested are as follow, each being conducted under the stated auspices:

11. The transportation to and from the residence district at this plant is as follows) State the transportation that would need to be used by the plant, if by car, the condition of the car service. Make any suggestions that may occur to you that would make it possible for the blind to go to and from work, also any general remarks regarding the general surroundings, housing and social conditions, that will enable the central office at Baltimore to determine its policy from the housing standpoint around this plant).

12. What are the conditions for getting in or out of the plant?

10. Institutions in the vicinity for the blind, which are interested are as follows, such other agencies which the state cooperates

11. The transportation to and from the residence district at this plant is as follows) State the transportation that would need to be used by the plant, if by car, the condition of the car service.

for the blind is or is not free are, they may general reserve regarding the general arrangements, however such medical conditions, they will provide the general office or Institutions to determine the policy from the governing standpoint around this plant)

12. What are the conditions for getting in or out of the plant?

13. Is this plant unionized (labor)?

14. What are the sanitary conditions in this plant and how located? Consider especially the following:

Toilets

Wash Rooms

Heat

Light

Ventilation

15. (a) What are the general safety conditions?

(b) How are the machines guarded?

(c) What are the means of escape from the plant in case of fire?

15. (a) What are the general safety conditions?

(b) How are the machines guarded?

SPECIFIC OPERATIONS OPERATION NO.

Fill this out only in cases where the occupation is thought a possibility for the blind or can be made a possibility for the blind.

1. Name and briefly describe this operation:

2. The employment is full time, seasonal

3. The possibility of displacing this operation by automatic machinery is as follows:

Give your opinion and the general reason for your opinion at this point.

4. The wage plan on this occupation is as follows (day work, piece work, bonus, etc.):

Amount

5. A blind man working on this job would probably receive wages on the following basis:

6. Working hours are as follow: Starting time_____

finishing time_____ noon hour_____ to_____

Following are details as to night shifts, present case and future possibilities (This would depend a great deal on the source of power, the output demanded, and other information that you will have to obtain from the managers of the plant):

7. The material passing through this operation is routed as follows (leave this out if route chart is furnished):

2. The employment is full time, seasonal

is as follows:

Give your opinion and the general reason for your opinion at this point.

4. The wage plan on this occupation is as follows (day work, piece work, bonus, etc.):

Amount

6. Working hours are as follows: Starting time _____

Finishing time _____ Noon hour _____ to _____

Following are details as to night shifts, present and future possibilities (This would depend a great deal on the source of power, the night hours, and other information that we will have to obtain from the managers of the plant):

7. The material question which occurs is raised as follows (Leave this out if your study is unrelated):

8. Describe the organization for moving material and keeping work ahead of each machine at all times.

9. The minimum physical and temperamental requirements for this operation (and any other information that may be of use in determining an educational program and the type of man required for this job are as follows:

10. The following qualifications would be very useful in handling this work:

11. Is this trade unionized? If so, the requirements of the union are as follow:

Are the requirements likely to be eased up any for the blind or handicapped?

12. In order that the blind may be able to handle this operation I suggest the use of the following jigs (If you have a rough idea what jigs could be adapted to this work, but are not certain as to the design of the jig, give your idea and the American Society of Mechanical Engineers will work on the jig design):

13. The cost of these jigs would be as follows:

14. In order that the blind may be able to handle this work, the following instructions would be required:

15. The following exhibits of work going through this process are being sent to Baltimore by express. (Obtain samples of the work to be done wherever possible, noting on the sample any defects that might possibly pass through a blind man's hands. Note also on the part anything about which there can be any doubt as to the blind man's ability to handle. Note who raised the objection, giving his name and position. This is needed to determine whether it is practical to try to teach this operation in the school at Baltimore. Place the full explanation of your exhibit on the paper which you attach to the exhibit, and in this space simply note what the exhibits are, so that they can be identified with this process when they arrive at Baltimore.

ahead of each machine at all times.

16. The following photographs of this work are being sent to Baltimore.

17. The following photographs are available at this plant for this work, but no prints are available to be sent to Baltimore.

18. (a) Number of men employed in this work in this plant

(b) Number of men employed in this work in this country

19. What is the attitude of men with whom these men will work toward the blind?

14. (a) Number of men employed in this work in this plant

(b) Number of men employed in this work in this country

15. What is the attitude of men with whom those men will work toward the blind?

APPENDIX C

PART I

SURVEY OF AN INDUSTRY

Survey submitted by _____

Address _____

_____

DATE _____

1. Nature of the industry _____

FIRM name _____

Address _____

Name and address of main office, if this a branch:

Name and addresses of branches, if this is the main plant:

2. Names and positions of the men in the plant through whom you worked in making this investigation.

3. The work in this plant is (reasons in each case)

   a. Seasonal

   b. Permanent

   c. Steady

   d. Temporary

4. Markets and their extent for the product of this plant:

   a. Foreign

   b. Domestic

FORM I

SURVEY OF UK INDUSTRY

Survey conducted by _____

Address _____

_____

Date _____

1. Name of the Investor _____

Full name _____

Address _____

Name and address of main office, if this a branch:

Name and addresses of branches, if this is the main plant:

2. Names and positions of the men in the plant through whom you worked in making this investigation.

3. The work in this plant is (reasons in each case)

a. _____

b. _____

c. _____

d. _____

4. Markets and their extent for the product of this plant:

a. Foreign

b. _____

5. Raw materials used by this plant are (give material, source, steady or uncertain supply):

6. Number of men employed in this industry in the U.S. (If the investigator is unable to answer this question, refer it to the statistical department, which will obtain the data from

United States reports): _____

7. Organization of the plant (If possible, include an organization chart which may be obtained by interview. See the Superintendent. Note under each of the following heads the name of the man holding the position and whether or not he is likely to cooperate in finding opportunities for the blind.)

a. Superintendent

Industrial Engineer

Other Important Executives

Head of Planning Department

8. How are foremen usually selected and trained in this plant? see the superintendent)

9. Are the foremen of the type likely to cooperate in training and assisting handicapped persons?

10. What facilities has the plant for training its employees? See the Superintendent. Indlude opportunities for evening school classes and other supplementary education as well as training given in a vestibule school or by special instructors in the different departments.

11. What plans are being considered for additional instruction of employees in this plant?

12. Has the plant an experimental or laboratory department?

Can it cooperate in working out special devices for handicapped men?

---

7. Organization of the plant (If possible, include an organization chart with key to control by letters. See its description.
Note under each of the following heads the name of the man holding the position and whether or not he is likely to cooperate in finding opportunities for the blind.)

a. Superintendent

Secretarial Secretary

Chief Inspection Specialists

Head of Planning Department

8. How are foremen usually selected and trained in this plant? (See the superintendent)

9. Are the foremen of the type likely to coop rate in training and assisting handicapped persons?

10. What facilities has the plant for training its employees? See the Superintendent. Include opportunities for evening school classes and other supplementary education as well as training given in a vestibule school or by special instructors in the different departments.

11. What plans are being considered for additional instruction of employees in the plant?

12. Has the plant an experimental or laboratory department?

13. Has the plant a balance of stores record?

14. What method is used to keep track of piece work?

15. What is the method of time keeping? (international or local)

16. If possible, supply a routing chart, showing how the materials travel from machine to machine and key to chart to your detail operations operating sheets.

17 The institutions for the blind in the vicinity are as follows (State auspices under which each is conducted-see Johnson with the Board of Education)

18 Transportation to and from the residence district about plant is as follows (Note condition of car service. Make any suggestion that may occur to you that would make it easier for blind persons to go to and from work)

19. Are conditions for entering and leaving the plant such as to enable blind persons to go to and from their work without accident hazards?

20. Make any general suggestions which you may have regarding the surroundings of the plant as to housing and social conditions

21. Does this plant employ only union labor?

22. What are the sanitary conditions in the plant? Consider especially the following:

a. Toilets

b. Wash rooms

c. Heat

d. Light

e. Ventilation

23. What are the general safety conditions? See State Factory Inspection Dept., Transportation Building)

24. How are the machine guarded

15. Has the plant a defense of stores record?

16. What method is used to keep track of piece work?

17. What is the method of time keeping? (International or local)

18. If possible, supply a routine chart, showing how the materials travel from machine to machine and by the shortest possible operating routes.

19. The institutions for the blind in the vicinity are as follows (State services under which each is conducted--see Johnson with the Board of Education)

20. Transportation to and from the residence district about plant is as follows (Note condition of car service. Make any suggestion that may occur to you that would make it easier for blind persons to go to and from work)

21. Are conditions for entering and leaving the plant such as to enable blind persons to go to and from their work without accident insured?

22. Have any general suggestions which you may have regarding the surroundings of the plant as to housing and social conditions

23. Does this plant employ only union labor?

24. What are the sanitary conditions in the plant? Consider especially the following:

a. Drinks

b. Rest rooms

c. Heat

d. Light

e. Ventilation

25. What are the general safety conditions? See State Factory Inspection Report. Transportation Building)

26. Are the machine operated

25. What are the means of escape from the plant during fire?

26. Does the plant have fire drills for its employees?

Appendix C
PART II

SURVEY OF SPECIFIC OPERATIONS

1. Plant Number

2. Operation number

3. Name of operation

4. Number of people employed at this occupation

a. In this plant b. In the country

5. Average earnings per week at this occupation in this plant

a. Now b. In normal times

6. Description of operation (sufficient upon which to base a preliminary time study)

7. Nature of employment with reasons

a. Seasonal

b. Steady

c. Temporary

d. Permanent

8. Changes in this occupation likely to occur because of the perfection of automatic machinery (State in full the reasons for your opinion)

Appendix I

SUMMARY OF SPECIFIC OPERATIONS

1. Plant Number
2. Operation number
3. Name of operation
4. Number of people employed at this occupation
5. Is this a
6. Is the
7. Machine
a. Manual
b. Steel
c. Chemical
d. Pressed
8. Changes in this occupation likely to occur because of the introduction of automatic machinery (State in full the reasons for your opinion)

9. The wage plan is as follows)day work, piece work, bonus)

10. A handicapped man working on this job would probably receive wages on the following basis:

11. Hours of work From to

Noon hour " "

Saturday " "

Are changes likely to be made in these hours?

Are there any night shifts on this operation?

12. What are the provisions for moving material to and from each operation

13. The material passing through this operation is routed as follows (Note each step in the process, unless you have provided a routing chart on your plant data sheet)

14. Requirements for employees on this operation are as follow:

a. Physical

b. General Education

c. Special Training

d. Temperament

e. Intelligence

15. Qualifications which would be helpful, but are not essential in doing this work:

a. Physical

b. General Education

c. Special training

d. Temperament

e. Intelligence

11. Hours at work (Time ... To ...

Time Lost ...

Reason ...

ire changes likely to be made in there hours?

Are there any night shifts on this operation?

12. What are the provisions for moving material to and from each operation

13. The material passing through this operation is routed as follows
(Give task with it the process, adding for here provided a routing chart
on your plans into sheet)

14. Requirements for employees on this operation are as follows:

a. Physical

b. General ...

c. Skills Training

d. ...

e. Intelligence

15. Qualifications which would be helpful, but are not essential in
doing this work:

a. Physical

b. General Dexterity

c. Special Training

d. Temperament

e. ...

16. Supplementary information regarding handicapped (Note whether this operation can be performed by persons suffering handicap in any of the members listed below. Note also any changes which need to be made in the machine or in the process to render it possible for handicapped men to do this work)

a. Legs

b. Arms

c. Hands

d. Fingers

e. Ears

f. Neck

g. Head

h. Trunk organs

i. Hernia

j. Lung wounds and pulmonary diseases

k. Skin

l l. Shell shock

17. What provisions are made by this company for training employees for this operation or work similar to it?

18. From what operation may employees be promoted to this task?

19. What are the probable opportunities for promotion from this operation.

20. Are there any special requirements regarding the nationality of the employees?

21. If this trade is unionized, note the requirements of the union and whether the requirements are likely to be eased up any for the handicapped.

e. Legs

h. Arms

d. Hands

g. Fingers

e. Eyes

f. Nose

g. Head

h. Chest organs

i. Nerves

j. Lung wounds and pulmonary diseases

k. Skin

l. Shell shock

17. What provisions are made by this company for training employees for this operation or work similar to it?

18. From what operation may employees be promoted to this task?

20. Are there any special requirements regarding the nationality of the employees?

21. If this trade is unionized, note the requirements of the union handicapped.

22. What is the attitude toward the blind or other handicapped of the foremen and other executives in this plant? Are objections to the handicapped likely to be raised by other workers in the department?

23. What special appliances are necessary in order that the blind or other handicapped may be able to perform this operation? (If you have a rough idea of the kind of appliances which would be adapted to this work, but are not certain as to the design, give a general idea of what you propose, and the American Society of Mechanical Engineers will work out the design.)

24. The approximate cost of these appliances would be about as follows:

25. The following exhibits of work going through this process are being sent to the Government by express (Obtain samples of the work to be done, wherever possible, noting on the sample any defect that might possibly pass through a blind man's hands, together with any part of the operation which cannot readily be performed by a blind man. Note also any item that might escape a man with any other handicap. Place the full explanation of your exhibit on the paper which you attach to the exhibit, and in this space simply note what the exhibits are. If doubts are raised as to the ability of a handicapped man doing any part of the work, give name and position of the one making the objection)

26. The following photographs of this work are being sent to the Government:

27. The following photographs of this process are available at this plant, but no prints can be sent to the Government:

23. What special appliances are necessary in order that the blind or other handicapped may be able to perform this operation? (If you have a rough idea or the kind of appliances which would be adapted to this work, and are not certain as to the design, give a general idea of what you propose, and the American Society of Mechanical Engineers will work out the design.)

24. The approximate cost of these appliances would be about as follows:

25. The following photographs of this work are being sent to the Government:

27. The following photographs of this process are available at this time, but we prefer not to send to the Government:

APPENDIX D

PART I

CODE USED IN MAKING SURVEY OF ARMOUR PACKING COMPANY

I. INTELLIGENCE

A. Highest grade of executive capacity

According to the figures gathered by the United States Army, this includes the first five percent of the pupulation.

B. Capable of acquiring and using technical knowledge and directing others

According to the findings of the U.S. Army officers, B intelligence includes the second ten percent of the population. Positions rating B should be positions requiring some degree of executive ability, a knowledge of research work, or positions requiring judgment involving a great deal of responsibility, or positions which require a high order of intelligence on the part of the operator suffering from the handicap noted on the sheet. For instance, a blind stenographer doing careful tabulated work would require B intelligence, while the ordinary typist would only rate at C.

C C. Ordinary intelligence

According to the U. S. Army officials the next seventy-five percent of the population will rank C.

D All others

In the upper grades of D classification will be those positions which are specialized and require the performance of the same operation over and over again, and where no great loss will occur if an error is made on this operation. At the lower end of the D scale are found those operations which can be performed by partially insane.

M MONTHS REQUIRED TO LEARN THE WORK UNDER AVERAGE CONDITIONS

The months required to learn the operation where a fairly good course of training is given is a good index as to the difficulty in training operators to do this work. Of course, it follows that the position that requires the longest time to learn, will be the hardest position to fill in the average manufacturing plant, and hence, offers a greater field for the handicapped, provided the handicapped can

PART I

learn to perform the operation well, since there will not be so much competition with skilled help. In case the operation requires less time than a month, take the full number of days required and divide it by thirty, making a fraction of a month which will indicate the number of days required.

T TRAINING AND EDUCATION

In order to determine this, consider the requirements of the position very carefully, and note just what the applicant for the position might be called upon to do. It is as important that the applicant for a position be properly placed according to previous training, as it is that he should be properly placed according to intelligence. Under no circumstances confuse intelligence with training. There may be people with a high grade of intelligence who are poorly trained, and many other people with college educations who will only rate C in intelligence.

X ILLITERATE

Manual jobs which do not require the applicant to read or write instruction cards will be placed in this class. When the opportunity for advancement is taken into consideration, the employee with a small amount of education is more likely to be satisfied with routine work than is the employee with a high grade of education.

B Can read blue prints

In every machine shop there are a few positions at least which will require the knowledge of blue prints, and these positions are, of course, much higher paid than the ordinary run of positions, since they require more or less engineering training, and are not in competition with ordinary manual jobs.

R Can read and write

There are a number of positions in most plants that require a man to read instructions. Some of them require that a man shall be able to make out instruction cards. It is rather important to know of these requirements when placing an employee.

C. Clerical training

This refers to an ordinary business course in some branch of office work, or the equivalent of same, and refers to positions such as bookkeeping, stenography, and other clerical technical positions.

well, since there will not be so much
a function of a work which will indicate the number of days required.

applicant for a position be properly placed according to previous
training, as it is that he should be properly placed according to
are poorly trained, and many other people with college educations
who will only rate C in intelligence.

X INSTRUCTOR

Manual jobs which do not require the applicant to read or write
amount of education is more likely to be satisfied with routine work
than is the employee with a high grade of education.

B Can read blue prints

In every machine shop there are a few positions at least which
of course, much higher paid than the ordinary run of positions, since
they require more or less engineering training, and are not in
numerical ability.

R Can read and write

There are a number of positions in most plants that require a
man to read instructions. Some of them require that a man shall be
able to make out instruction cards. It is rather important to know
of these requirements when placing an employee.

C. Clerical & sitting

This refers to an ordinary business routine in some branch of office
work, or the equivalent. It refers to positions such as bookkeeping,
positions.

S. Secondary technical training

Such positions require a knowledge of engineering, a knowledge of business practice, or some general knowledge, or may require meeting the public in some way that necessitates a man's having something more than the ordinary grade school education. When looking over the requirements of the position, it is generally well to determine what the requirements are regarding promotion, etc., so as to determine the extent of the education required to properly fill the position.

U. University or college technical training

The positions are generally positions of an experimental nature, or positions requiring administrative ability or both. It is well to remember that not all men who are shot on battle field or injured in industries are men of mediocre ability, and that positions must be found for the man of exceptional training as well as for the man who has not been trained previous to his entrance into military life or previous to his being in an industrial accident. As a general rule, positions which require a very thorough knowledge of analysis, such as the ability to follow up and analyze research topics, are positions which require a university or college technical training. All positions of a professional nautre will fall within this class.

A ARMS-NUMBER

To determine the number of arms, legs, fingers, or hands required to handle any operation, it is necessary to make a rather careful motion study of the operation in question, It is well to remember that the motions involved in each part of the arm or leg must be very carefully considered. There are hooks on the market which to with artificial arms which permit the worker to make any direct pull which can be made with the shoulder muscle if enough stump is left to allow the placement of the artificial arm. If the work requires movement of the elbow, but does not require the use of the fingers, it may be possible to make use of a hook in place of a hand, and in that case, the position would call for arms, but not hands.

In all cases the matter of safety must be considered. If a position is hazardous without the loss of any member or sense, the man so handicapped should not be given a position working on this operation. At all times the means of going to and coming from the work inside the plant must be considered. Where the operator can sit all day long and perform the operation efficiently, it is obvious that legs are not required unless there is some particular foot operation which could not be handled by the stump of the leg. It is well to remember also that there are very good artificial legs on the market that will

the extent of the education required to properly fill the position.
what the requirements are regarding promotion, etc., so as to determine
requirements of the position, it is generally well to determine
more than the ordinary grade school education. When looking over the
the public in some way that necessitates a man's having something

U. University or college technical training

positions requiring administrative ability or both. It is well to
The positions are generally positions of an experimental nature, or

remember that not all men who are shot on battle field or injured
in industries are men of mediocre ability, and that positions must
be found for the man of exceptional training as well as for the man
who has not been trained previous to his entrance into military
life or previous to his being in an industrial accident. As a general
rule, positions which require a very thorough knowledge of analysis,
such as the ability to follow up and analyze research topics, are
positions which require a university or college technical training.
All positions of a professional nature will fall within this class.

A LIMBS-MUSCLES

To determine the number of arms, legs, fingers, or hands required
to handle any operation, it is necessary to make a rather care ful

the motions involved in each part of the arm or leg must be very
carefully considered. There are books on the market which to with
artificial arms which permit the worker to make any direct pull
which can be made with the shoulder muscle if enough stump is left to
allow the placement of the artificial arm. If the work requires movement
of the elbow, but does not require the use of the fingers, it may be
possible to make use of a hook in place of a hand, and in that case,
the position would call for arms, but not hands.

In all cases the matter of safety must be considered. If a posi-
tion is hazardous without the loss of any member or sense, the man
plant must be considered. Where the operator can sit all day long and
At all times the means of going to and coming from the work inside the
required unless there is some particular foot operation which could
that there are very good artificial legs on the market that will

enable the operator to walk about and handle himself very well, provided he is not called upon to stand all day. In fact, many operators handle standing jobs with artificial limbs. Chairs can be devised which enable an operator to work on operations at the same level over a horizontal distance of several feet. In all cases, the engineer is called upon to use ingenuity to determine what might be done to make this operation possible for a handicapped man, and if the means suggested would not in any way cut down production, the minimum requirement is given accordingly, together with an explanation of how this requirement was arrived at. Care must be taken on the part of the engineer to make sure that he thoroughly understands the requirements of the job as to the number of limbs or sense. If it is proposed to change the operation in any way, notation as to the change ~~the~~ should be clearly made, so that those checking the report may have a record of the change in question.

K NERVES

N. Normal

A job which requires that the operator be able to rely on a steady nerve at all times is said to require normal nerves. This does not necessarily mean that the person shall have exceptional nervous strength.

R Reliable

Occupations where the nervousness of the employee has but little to do with the output or the general welfare of the employees, but which requires that the employee shall not be subject to fits of any kind or to similar nerve disease are said to require reliable nerves. Under this classification, the employee must not be in doubt at any time as to how his nerves are likely to act.

S. Shell shock

This is the lowest form of nerve disease that can be used in industry. On these operations, fits, etc. are not serious.

H. HANDS-NUMBER

See A. Arms

E EARS OR HEARING

N. Normal

Operations requiring that a person shall be able to hear all ordinary sounds, shall be able to distinguish trouble in a machine by means of sound, will be rated as normal operations.

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The Question of detection of trouble in machines, and the detection of danger from the sense of sound is one that must always be looked into when studying hearing requirements. If the person is in a position where the element of danger does not enter if the hearing is not acute, and it is unnecessary for him to distinguish between sounds and where there are not a great many verbal instructions to be understood, the applicant does not require normal hearing.

P. Poor

A position that requires that a person receive instructions that are given him by means of ear trumpet or some other form of hearing device, and that he shall be able to hear extraordinary noises such as danger signals, and in which it is not necessary to detect faults in the machinery by listening to the machine, may be rated as one requiring but poor hearing. As a general rule, in this case, the instructions should be written and care should be taken to see that it is possible for the applicant to note any extraordinary danger, either by sight or by hearing an extraordinary noise that he can detect.

D Deaf

There are a number of positions in every plant which are not at all dependent on hearing, and for these a man may be deaf. It does not necessarily follow that a person be dumb, since there are a number of well educated people in the country who can carry ona conversation by following the motions of the lips. Of course, in all such cases the working instructions of the plant must be written out. Care should be taken that there is no possible danger that can come to the worker through his inability to hear danger signals.

F FINGERS

See A. Arms

K KIDNEYS AND OTHER TRUNK ORGANS

This includes the kidneys, heart, and bowels.

N. Normal

All positions requiring extraordinary application to the work in hand or involving work with poisonous fumes should be rated normal.

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sounds and where there are not a great many verbal instructions
is not acute, and it is unnecessary for him to distinguish between

F. Poor

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The Eye

This includes the kidneys, bones, and bowels.

A. Normal

All positions requiring extraordinary application to the work

F FAIR

Positions which require only the ordinary strain, which do not require the lifting and handling of heavy weights, and which do not require exceptional speed, may be handled by a worker having fair trunk organs.

W WEAK

Positions requiring but little application at a definite time but which require a certain amount of output during a longer period, may be handled by an applicant with weak trunk organs, provided this output is not too great.

U Unfit

Only such positions as require but very little application and very little strength should be handled by an applicant with weak trunk organs. There are, however, a number of positions in every plant which are generally considered more or less sinecures, where an employee is nevertheless required, such as opening and closing doors. These could be handled by an applicant with very weak trunk organs.

L LEGS

SEE A ARMS

R RUPTURE OR HERNIA

Hernia is now generally considered a disease. As the disease develops the hernia is likely to grow worse, and unless the disease can be remedied or the cause removed, it is not safe to place any person with hernia on any work requiring heavy lifting. The presence of a hernia, however, does not disturb work requiring especially fast movement where heavy lifting is not involved.

N NORMAL

Positions, the nature of which exclude a man who has a hernia.

H. Hernia

Positions on which a man may have a hernia.

P PULMONARY OR LUNGS

It will be noted that practically all the positions in the Stock Yards require normal lungs. The reason for this is obvious. As the employees are continually handling meat, and food that is to be eaten by other people, it is therefore extremely necessary that no person be employed who is likely to infect the food.

Positions which require only the ordinary stamin, which do not require the lifting and lowering of heavy weights, and which do not require constant speed, can be handled by a strong lad having fair trunk organs.

M MEN

Positions requiring but little application at a definite time may be handled by an applicant with weak trunk organs, provided this organ is not too weak.

Only such positions as recpil a but very little application and little strength should be handled by an applicant with very weak trunk organs. There are, however, a number of positions of easy grade which are generally considered more or less sinecures, where an employee is nevertheless required, such as opening and closing doors. These could be handled by an applicant with very weak trunk organs.

K K RETURN OR HERNIA.

Hernia is now commonly considered a disease. As the disease of a hernia, however, does not disturb work requiring especially fast movements where heavy lifting is not involved.

R. NOT M.

Positions, the nature of which excludes a man who has a hernia.

H. Hernia

Positions on which a man may have a hernia.

E R RUNS

It will be noted that practically all the positions in the Stock Yards are manually handling work, and food that is to be eaten by also people, it is a measure extremely necessary that no person be employed who is likely to infect the food.

N. Normal

Positions which require normal lungs would include all dusty operations, all operations where the ventilation is poor or might be poor, and all similar operations which might require more or less lung strain, also all positions where diseases of the lungs might be communicated to other people.

P. Poor

Occupations where the ventilation is fairly good, but in which no dust or lint is involved may be handled by a man with poor lungs.

A. Arrested Tuberculosis

Many people misunderstand tuberculosis. The modern theory among the leading physicians in the country seems to be that if a case of tuberculosis is taken in time, it is possible to stop it. No person with an active case should be allowed to work in any industry, but should be sent to a sanitarium where he can be cured. If this is impossible because of financial considerations, the only thing left is to place the person on some form of very light occupation where the work is mostly out of doors, and where the exposure is not necessarily too great. A person with an arrested case can work on any occupation where the ventilation is exceptionally good, where there are no fumes or dust to aggravate lung conditions.

S SKIN

N. Normal

An occupation which exposes portions of the employer's body to acid action or to other chemical action, or wet occupations and all which might lead to infection of other people if a diseased condition should result, require a normal skin. This will apply to the direct handling of brine, acid, or alkaline waters, and to all wet chemical operations. In order to be rated as normal, a skin need not have an exceptional strength or endurance.

I Irritated

A skin which is either very tender, or which due to a past disease condition of some kind will be very easily irritated by dust or water or other similar conditions, but a skin which is not at the present time diseased. Occupations handling brine, acid, or that require the applicant's hands come in direct contact with food stuffs cannot be handled by people with irritated skin. Some washing operations could thus be handled, provided the conditions were not such as to lead to chaffe.

operations, all examinations where the ventilation is poor or might be poor, and all similar operations which might readily more or less lung strain, also all positions where diseases of the lungs might be communicated to other people.

P. Poor

Occupations where the ventilation is fairly good, but in which no dust or light is involved may be handled by a man with poor lungs.

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occupations. In order to be rated as normal, a skin need not have an exceptional strength or endurance.

I Irritated

A skin which is either very tender, or which due to a past

D. Diseased

Outside of a few positions in handling machinery some distance from where the food proper is being prepared, there are but very few positions in the packing plants where a person with diseased skin could safely work. Care must always be taken that the employee thus handling does not endanger the health or convenience of those around him. There are many other industries, however, in which a person with diseased skin could very easily work.

V VISION

N. Normal

All positions which require sufficient sight to be able to write and read with glasses are said to require normal vision. Normal vision does not imply exceptional visual strength. Before gauging any item as to vision, it is well to ask the question as to whether the position requires judgement based upon sight, or whether exceptional danger may follow because of the lack of sight, remembering at all times that those who have not their sight are naturally a little timid, and are not likely to take the chances that an ordinary employee will take.

P. Poor

This applies to all persons who have not sufficient eyesight to read and write ordinary print with glasses, but sufficient eye sight to find their way around, and perform occupations that can be handled very largely by the sense of touch. For instance, a man sanding chairs in the ordinary finishing room, where there is no one to supply him with stock or to take his finished product away, would probably require at least poor sight, since it would be necessary for him to be able to see the pile of unfinished chairs and the finished, but it would not be necessary to see the individual spot where the chair was sanded, since the touch can be cultivated to the point where it is much better index of the quality of the work done than is the sight. The method of sanding can be determined by accurate education by the foremen or sub-foremen.

B. Blind

This includes not only all people who have not sufficient sight to see ordinary objects, but includes all people who are merely able to distinguish between daylight and dark. It is generally well to remember that any occupation which can be reduced to a set of motions can be eventually handled by a blind man provided there are no other outside circumstances, such as safety, to affect the problem. The general question to ask in rating blindness is to determine whether it requires judgement based upon sight. If not, it is opened for the blind. In many cases, it is possible for the investigator to call the attention of the factory officials where the judgment required on three or four consecutive operations can be controlled by one person, allowing the remainder to handle their part of the work as a straight matter of routine. As a general rule, whenever this can be done, the output of all parties concerned can be very materially increased.

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K. Normal

All positions which require sufficient sight to be able to write and read with glasses are said to require normal vision.

ordinary employee will take.

Poor

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APPENDIX E

SURVEY OF THE PACKING INDUSTRY

The packing industry to the casual observer means the meat packing industry. This conception, however, is inadequate; the packing industry has grown to such tremendous size that today it controls, for the most part, the butter, cheese, and condensed milk, the canning and preserving, the leather tanning, curing, and finishing industries, fish packing, poultry, and eggs. In view of the fact that the development has been toward concentration, it is easy to see how great packers are able to produce profitably many subsidiary products. Many materials, which would be wasted under small scale production, can be made into useful articles. The margin of profit, of course, is necessarily small, and the tremendous volume, of the packers alone makes it possible to save. For instance, in certain rendering processes, there is a small quantity of tallow extracted in order to make the lard more pure. When thousands and even millions of pounds of lard are thus purified, the residue of tallow is sufficient to make it profitable for the packers to furnish a large share of the market's supply. In like manner albumen is extracted from the blood of slaughtered animals and the packers become a source of one of the essential ingredients of varnish. Even with this saving, blood would be a great waste if it were not utilized for fertiliser, production of potash, etc.

During the process of curing and packing, the meat must be kept in a cooled room. The quantity of ice required for their own use made it profitable for the packers to manufacture ice, not only for their own use, but also for sale.

Labels and advertising materials are necessary for the effective distribution; hence it became profitable for the packers to install their own printing establishments to supply their own needs and the needs of some of the other industries. In a similar manner a long list of subsidiary products which are vitally related to the meat packing industry, have developed along with the packing industry. Among the subsidiary products, the following are a few of the most important; soap, fertilizer, lard compounds and substitutes, condensed milk, canned and preserved fruits and vegetables, paper and wood pulp, job printing products, ice, glue, petroleum, pickles, steam cars, leather, chemicals, wooden boxes, grease and tallow, dressed poultry, upholstering materials, saurkraut, butter, oleomargarine.

Because of the necessity of making use of by-products, the tendency of the meat packing business in the U.S. has been to draw around it a large group of industries which were not strictly meat packing. When considering the study of any of the large packing houses, to thoroughly understand the scope of work covered, one must understand the work of the packing industry.

SUMMARY OF THE PACKING INDUSTRY

The packing industry, to the casual observer means the meat packing industry. This conception however, is inadequate. The packing industry grown to such tremendous size that today it controls, for the most part, the butter, cheese, and condensed milk, the canning and preserving, the leather tanning, curing, and finishing industries, fish packing, poultry and eggs. In view of the fact that the development has been toward concentration, it is easy to see how great packers are able to produce profitably many subsidiary products. Many materials, which would be wasted under small scale production, can be made into useful articles. The margin of profit, of course, is made possible to save. For instance, in certain rendering processes, there is a small quantity of tallow extracted in order to make the lard more pure. When thousands and even millions of pounds of lard are time purified, the residue of tallow is sufficient to make it profitable for the packers to furnish a large share of the market's supply. In like manner albumen is extracted from the blood of slaughtered animals and the packers become a source of one of the essential ingredients of varnish. Even with this saving, blood would be a great waste if it were not utilized for fertilizer, production of potash, etc.

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[illegible] one must understand the work of the packing industry. [illegible] thoroughly understand the scope of work covered, [illegible] when considering the study of any of the large packing [illegible]

The following published table gives a very good idea of the size of one concern (1917 figures):

Total Employees	57, 546
Killing Plants	16
Branch Houses	400
Ground Area in Acres	500
Floor Area in Square Feet	2,000,000
Number of Visitors	250,000
Amount Paid for Cattle(U.S. only)	$172,084,300.00
Amount Paid for Sheep (U.S.only)	$21,052,600.00
Amount Paid for Hogs (U.S.only)	$160,338,500.00
Amount Paid for Calves (U.S.only)	$10,909,500.00
Number of Fertilizer Plants	28
Refrigerator Capacity in Tonsper day	17,126
Motor Trucks in Service	699
Runabouts in Service	538
Wagons in Service	868
Buggies in Service	165
Sleighs in Service	133
Horses in Service	1,077

Horses in Service 1,647

Sheep in Service 1,350

Burros in Service 350

Cattle in Service 800

Floor Area in Square Feet 2,000,000

Ground Area in Acres 800

Value of Chickens 10

Amount Paid for Cattle (U.S. only) $178,084,400.00

Amount Paid for Sheep (U.S. only) $21,000,000.00

Amount Paid for Mules (U.S. only) $180,000,000.00

Amount Paid for Horses (U.S. only) $10,000,000.00

This policy of centralization has extended, not only to the grouping of other lines of business around the packing houses, but has also shown itself in the increasing size of the various large companies, the reason, of course, being that the greater the quantity of by-products which could be handled as a single unit, the more efficient the use made of this by-product. Along with this centralization has come the large use of automatic machinery-the tendency to reduce the amount of labor per dollar of food products. The charts attached herewith as a portion of this report, give an idea of the growth of the packing industry since 1850.

It will be seen from these charts that the value of the products, as a general rule, has increased very materially of late years. There has been some thought of foreign competition, but the chance of this competition reducing very materially the work of the packing houses is very remote, since European markets are absorbing nearly all the South American and Australian meat. Conditions in this country at the present time, however, seem to point to a tendency to a gradual dropping off in the increase of growth of the packing industry, since most of the country is now settled, and the intensive cultivation of cattle is well under way. The growth that we may expect in the packing houses in the next few years will be toward larger units of production for the same, or slightly increased total quantities of work handled.

The working conditions in the Stock Yards are not especially good, but are vastly improved over conditions that existed formerly. The men now receive a guaranteed number of hours per week, and receive a minimum wage of forty cents per hour. From the standpoint of the blind and handicapped, the tendency of the packing houses toward centralization and toward the specialization of occupations within the plant is especially encouraging, since the more highly specialized the occupation, the more available it is for the use of the blind.

It will be seen by the map attached that the packing and canning industries in the U.S. are very widely scattered, and there are very few cities in which some of these plants do not exist. Even in the country districts the canning factories will take care of a large number of workers.

It will, therefore, be seen, that while a study may be made of a single packing house, the application of the data obtained from this study is almost universal throughout the country, and what affects a comparatively few in one yard affects a great many thousands

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in other sections. It is with this in mind that this report of the Armour Packing Co. survey of occupations is submitted. The statistics on P.-M2-will give some idea of the size, and the no. of employees, of this large packing house.

The packing plants commonly known as the "Big Five" are operated on the chain production system; that is, each man's work is highly specialized, and the animal is carried from operator to operator as each operation is performed. This method of production is used in a large number of items, especially in assembl work such as the assemblin plants of automobiles. Practically the only difference between packing plants and the assemblin plants is that in the packing plants the assembled article is taken down instead of built up. All of the operations in the plant can, therefore, be divided into three classes:

1. Operations performed directly on the animal or some part thereof.

Work performed in handling the machinery and apparatus.

Operations performed on raw materials other than the animal.

In order to determine what type of operation is involved at any time, the following code has been arranged to differentiate between the articles upon which the work is done:

C-Cattle

H-Hogs

S-Shipper hogs

L-Lambs or Sheep

K-Calves

M-Machinery,etc.

The operations differ in their general character. Some consist of cutting material off the animal and diverting it to some other point, while others consist in preparing the animal so that part of it may be cut off at some future operation. Obviously, where material is cut away from the animal and sent to another department, a second ch k is needed to trace operations in the new department, since the animal itself goes direct to the next operation in the first department. In order to distinguish between the two types of operations, the following code has been decided upon.

In order to determine what type of operation is involved at any time, the following code has been arranged to differentiate between the articles upon which the work is done:

K-Hogs

S-Shipper Do a

L-Lambs or Sheep

K-Calves

M-Machinery,etc.

R Remaining operations; those operations in which nothing departs from the animal, and at which point, therefore, it is unnecessary to consider any operations outside the department.

D Departure operations; those operations where something has departed from the animal and gone to the next department. At these points, it is necessary to index the operation on the part that has left the animal to a second department and the report number is given so that the thread may be taken up.

The operations themselves are numbered consecutively in each dept. In indexing the departure depts. which branch off from the departure operation in the main department, the departure operation no. becomes the first part of a new department number. This is usually followed by the initial of the departing portion of the animal to make up the department report no. When the operations in the new dept. are numbered with their report no. and their serial number with their individual classification as R,D, or . The operation no. is always placed in the lower left hand corner of the preceding chart box.

In the lower right hand corner of the procedure chart box is placed the number of employees on this operation. If this varies, the variation is given.

In the upper right hand corner of the box is given the rate per hour, rate per hundred, or per unit, depending upon the unit of payment in each particular plant. In case of the packing industry the rate is generally rate per hour, and wherever items appear without other qualifications in this chart, it will be known as the rate per hour. In the center of the box will be found the name of the operation as ordinarily known in the plant. This refers always to the particular operation name, and may not be the title of the position that the man holds, although the name of the operation generally suggests the title of the man holding that position.

In the upper left hand corner will be found the requirements of this position as indicated by code. The top line indicates the items qualified. The lower line the rating for each factor noted on the upper line. Each letter or figure, therefore, on the lower line always qualifies the corresponding letter on the upper line. The key to the code and the scheme for grating is shown as Appendix D.

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establish any operations outside the department.

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In the lower right hand corner of the procedure chart box is placed the number of employees on this operation. If this varies, the variation is given.

In the upper right hand corner of the box is given the rate of payment in each particular plant. In case of the pooling industry the rate is generally rate per hour, and wherever items appear without other qualifications in this chart, it will be known as the rate per hour. In the corner of the box will be found the name of the operation as customarily known in the plant. This refers always to the particular operation name, and is not be the title of the position that the man holds, although the name of the operation generally suggests the title of the man holding that position.

of this position as indicated by code. The top line indicates the time a per line. Each letter or figure, therefore, on the lower line in the code and the scheme for spacing is shown as Appendix A.

The accompanying chart shows a flow sheet of the first twenty operations of Armour Packing Co, and illustrates the methods followed. The first operation in beef during the cattle is driving the cattle into the killing pens. Nothing is at any from the animal at this point; hence the operation noted at the lower left hand corner of the box is NIL. In the lower right hand corner of the box is given the number of employees as 1.

In the upper left hand corner are given the requirements of the job. The line above gives the items qualified as noted above, and the line below represents the requirements in this particular. The requirements of driving in would be:

Intelligence, medium or fair:

Time to learn, one day:

Training required, none;

Education and previous training required, none;

Nerve requirements, must be reliable;

Hands required, two;

Hearing must be normal;

Fingers required, eight;

Trunk organs must be normal;

Legs required, two;

Hernia permissible;

Lungs must be normal;

Skin may be diseased;

Vision must be normal.

The rate of pay is given in the upper right hand corner of the box. In the case of cattle killing, nothing leaves the animal to a process in other departments until operation 17 or blood catching. The blood catcher catches the blood in buckets and sends it to the albumin department, where it is made into albumin. Albumin

number of employees in 3.

on. The line above that below represents the requirements of the
In the upper left hand corner are given the requirements of the

manufactures becomes known as Chart no. CDYA. By referring to the organization chart, we notice that the line of promotion of these twenty-four operations is through the killing foreman to the foreman and assistant superintendent of the plant, although as a general rule, a man progresses from common labor to skilled labor, and from the lower grades of skilled labor to the higher grades of skilled labor.

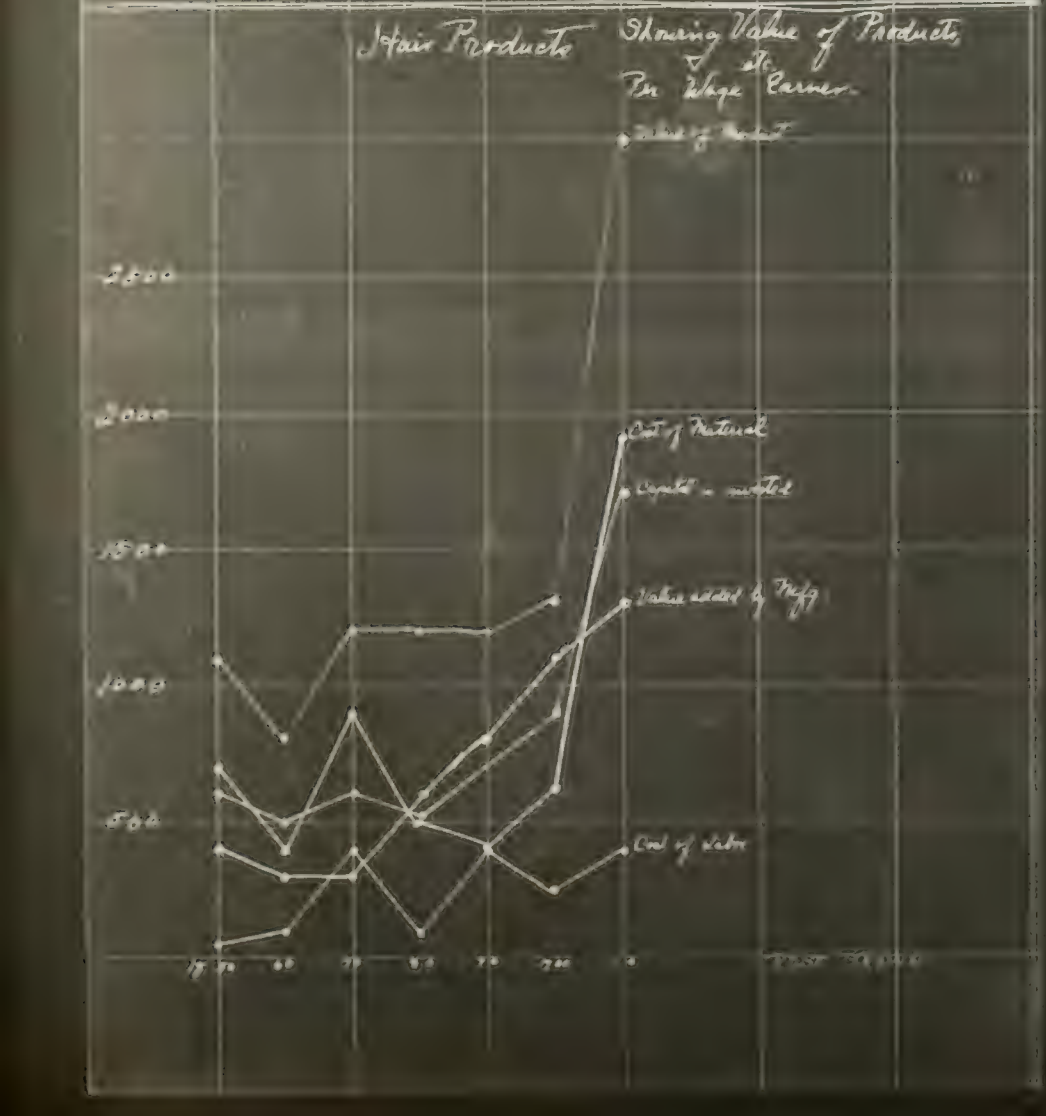
Looking now at the organization chart in Box 4a2, we find that there is one driver in the plant and he is concerned with operation no. crl, and it takes from one to two thirtieth of a month to train him. The space for the rate is in the upper right hand corner of the box. Inthe next box, we find that there are four knockers' in the plant, and that it takes from one to two months to train them, and then they are concerned with the second operation on the cattle. Between these two charts, it is possible to obtain any data that we desire regarding requirements, the salar, and opportunities for advancement.

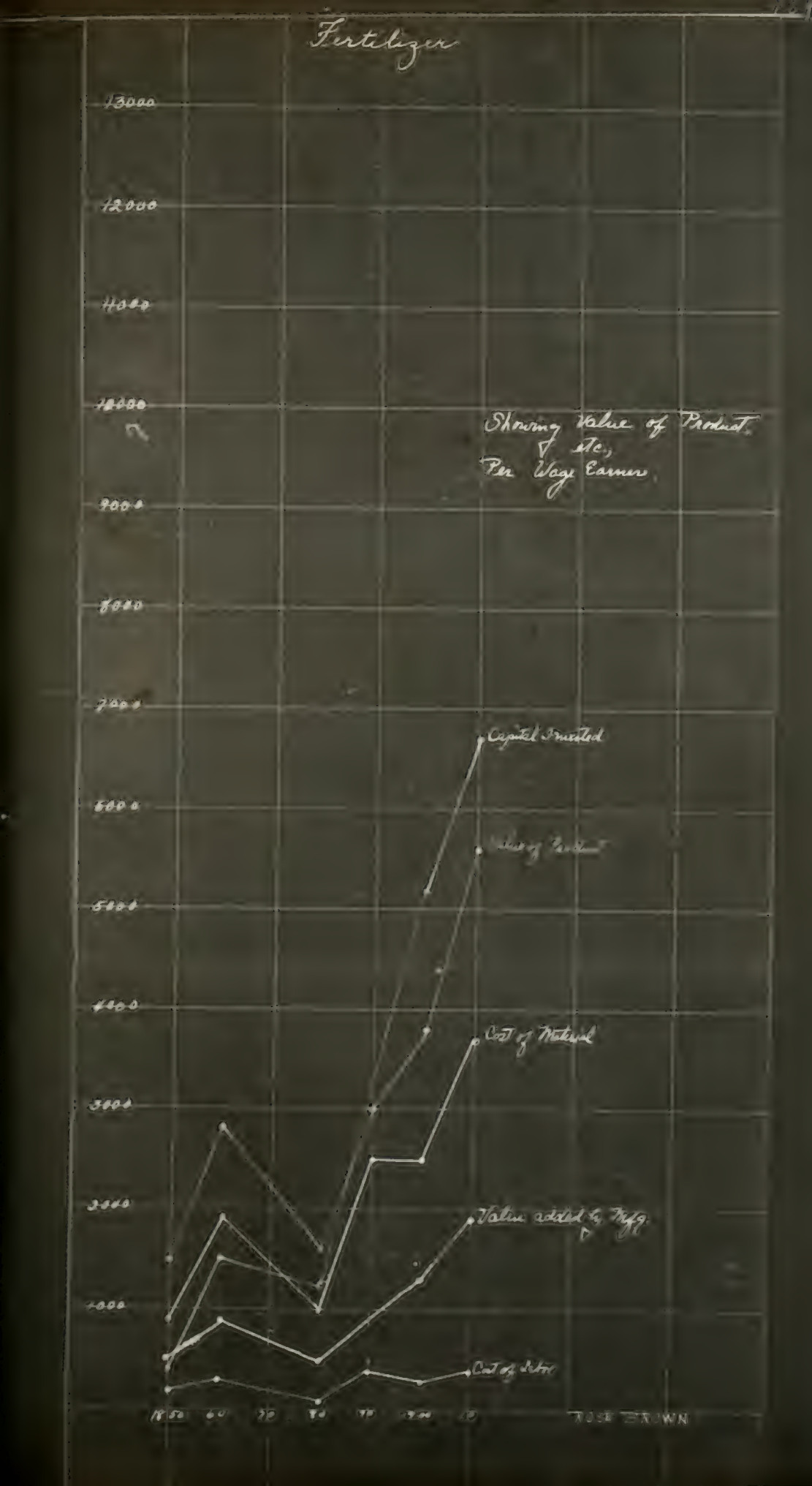
The big advantage offered by the flow sheet is an automatic index to all other charts or different depts. For instnace. if we wish to locate the chart for the fertilizer department, we have only to turn to chart M. MD8F in the files and we have all the operations in the fertilizer department on a single chart.

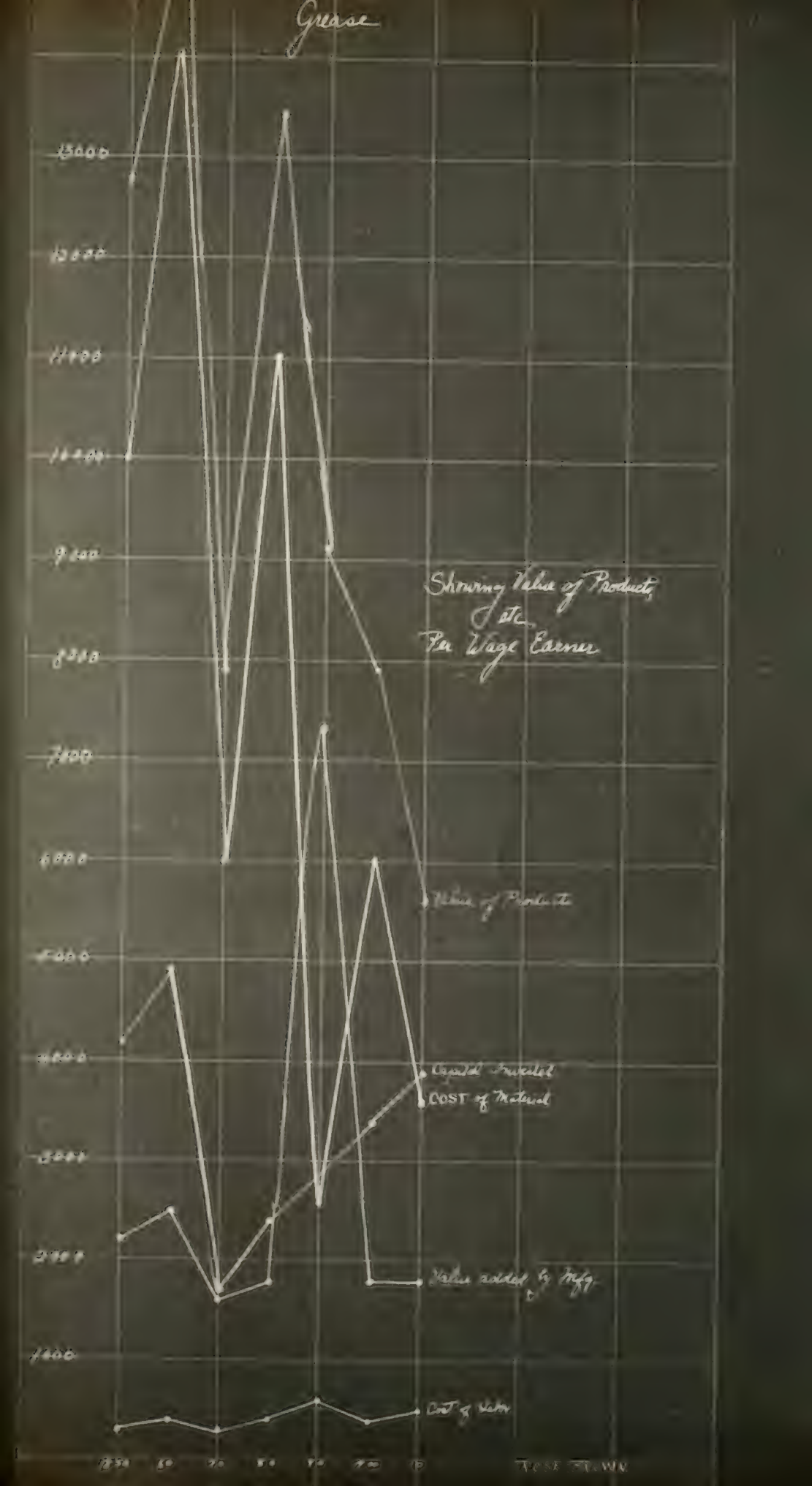
There are employed in the U.S. 540,000 people in the packing and canning industry according to the 1910 census report. If the same percentage applies of the entire industry as applies to Armour Packing Company, the number of people in the packing industry who could be blind would amount to the enormous total of 46,750. This, most assuredly forms one of the greatest fields for blind placement that there is in the entire country.

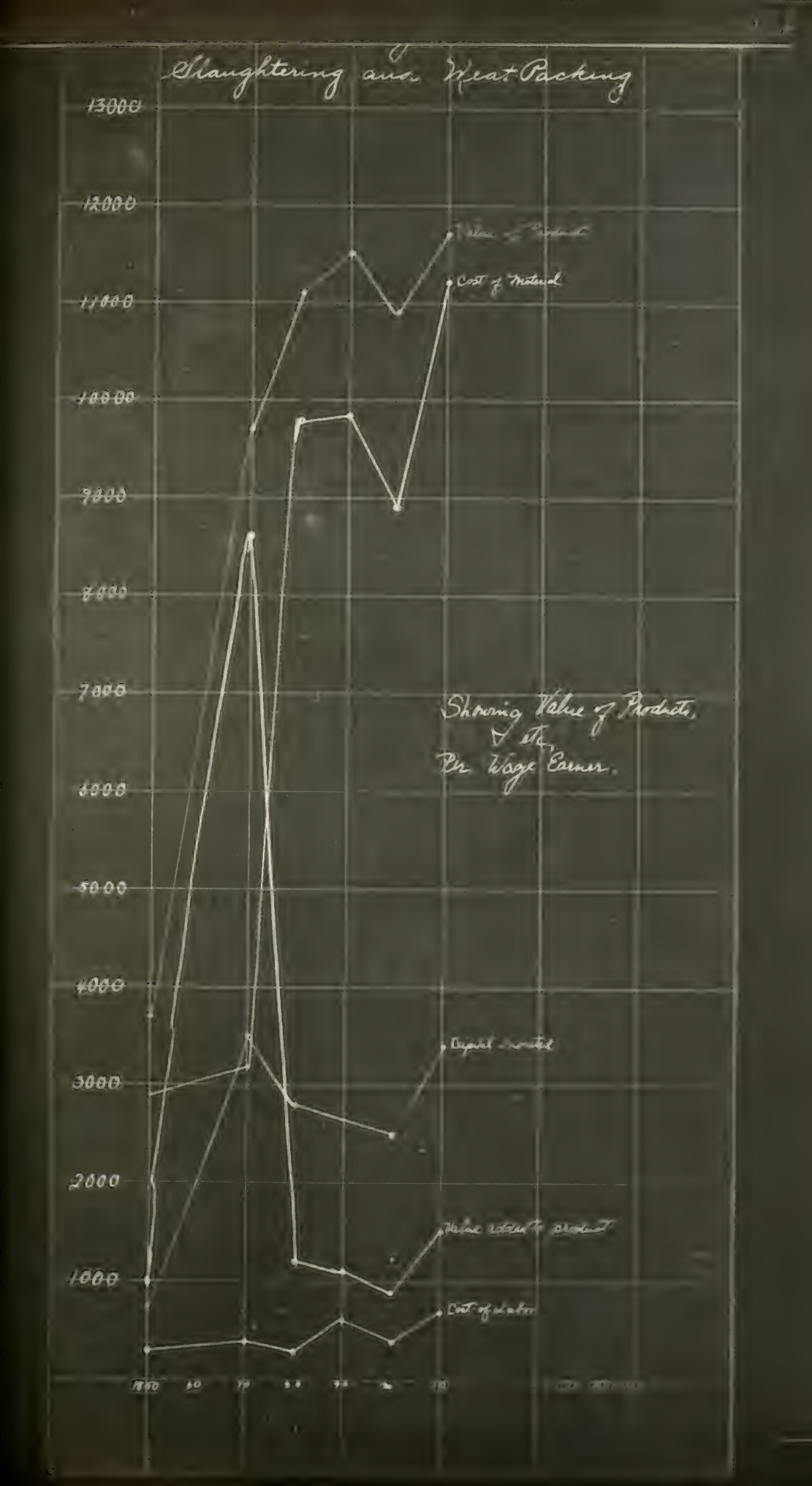
Value and Costs

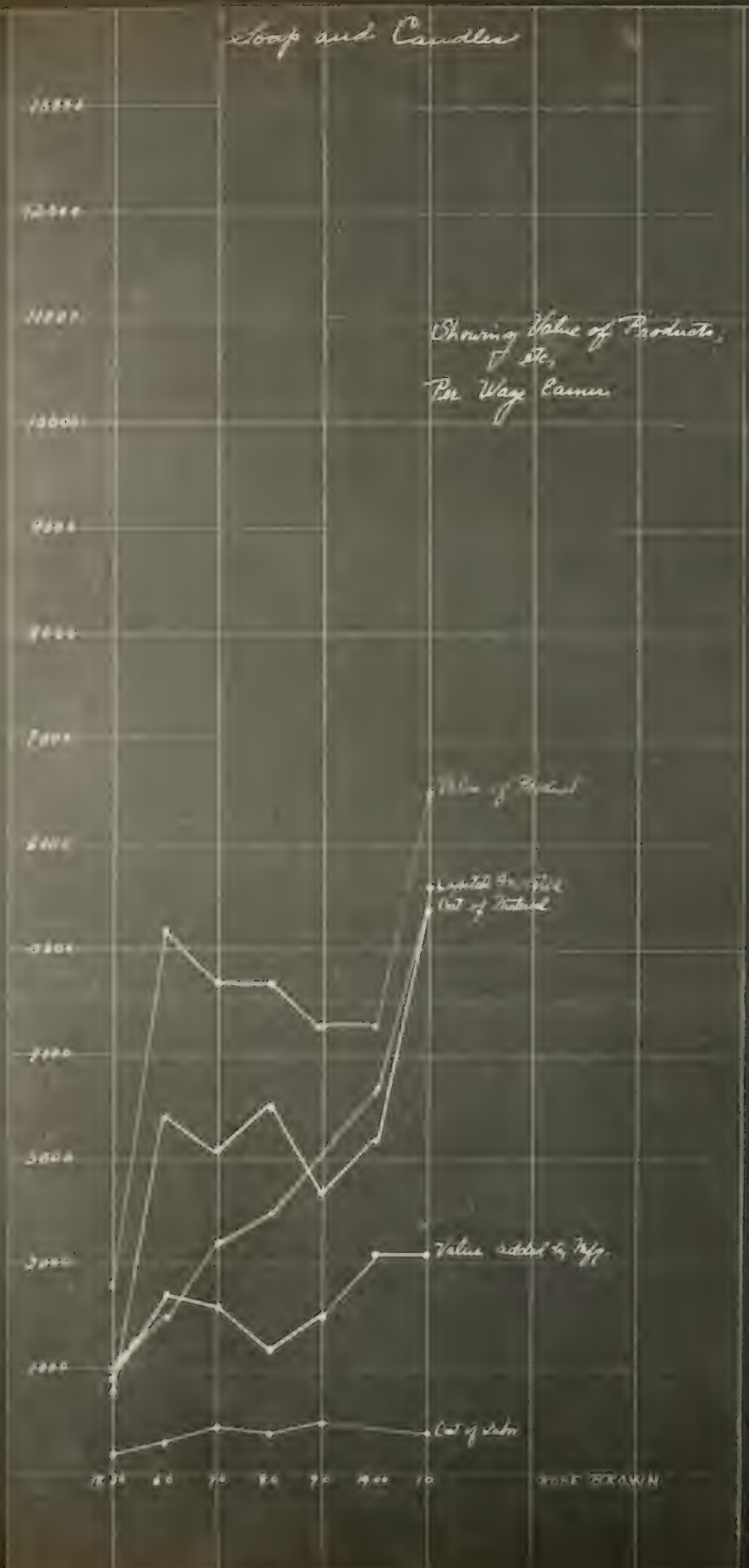
Buttons and Bone Products
Showing Value of Products, etc. Per Wage Earner
Value added by Mfg
Value of Product
Capital invested
Cost of Material
Cost of Labor

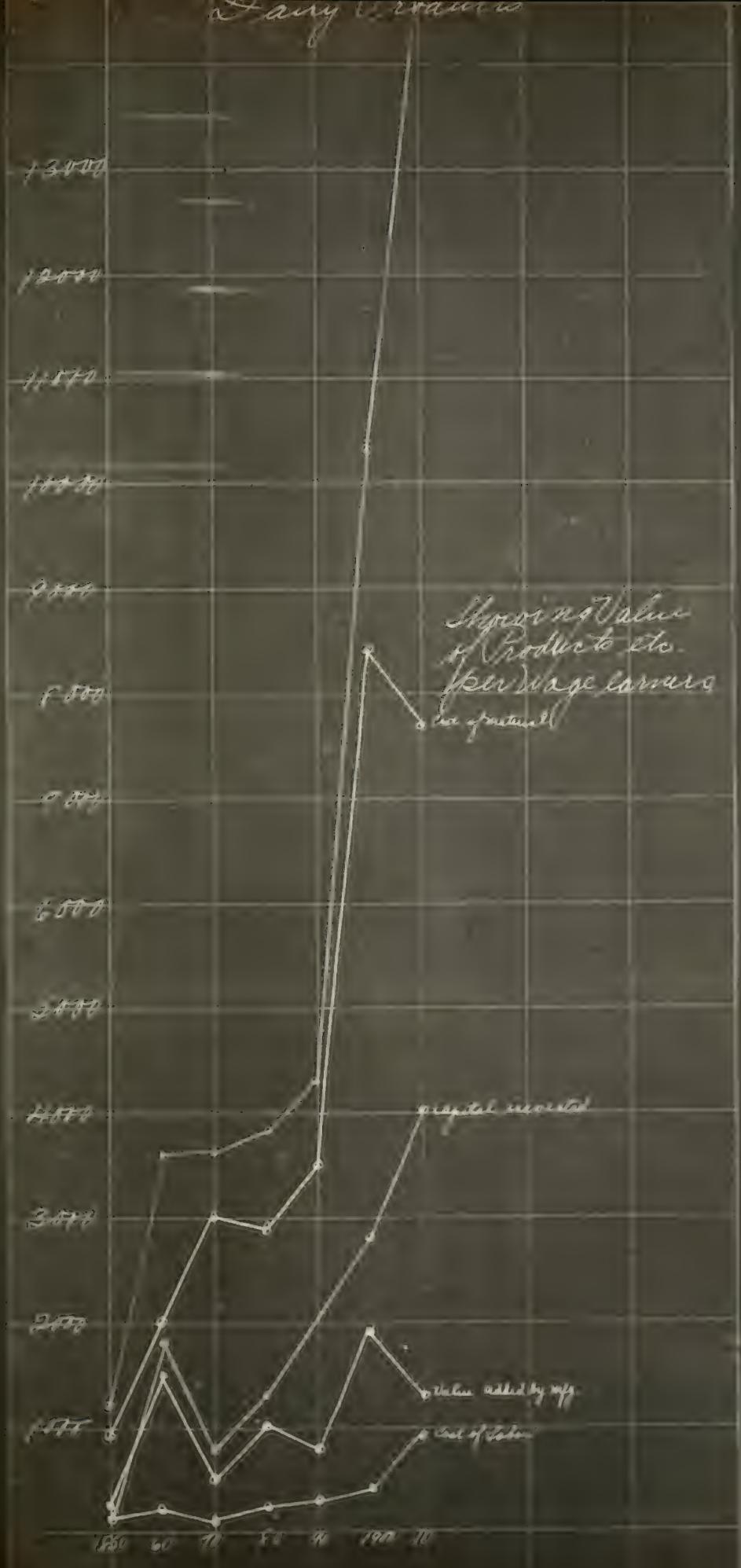

Hair Products
Showing Value of Products, etc. Per Wage Earner.
Value of Product
Cost of Material
Capital invested
Value added by Mfg
Cost of Labor

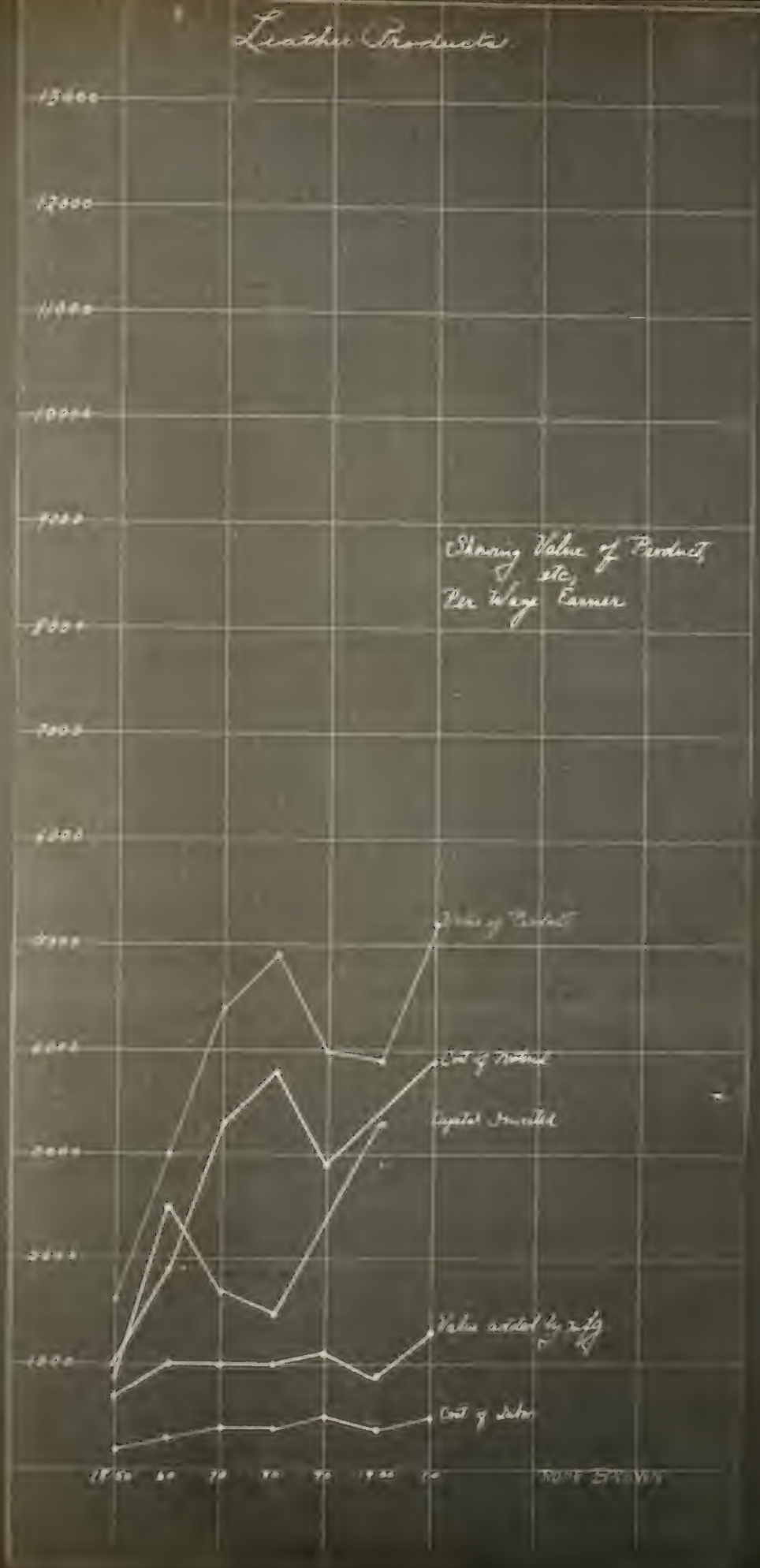

Fertilizer
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
Showing Value of Product etc., Per Wage Earner
Capital Invested
Cost of Material
Value added by Mfg.
1850
60
70
80
90
1900
10
ROSE BROWN

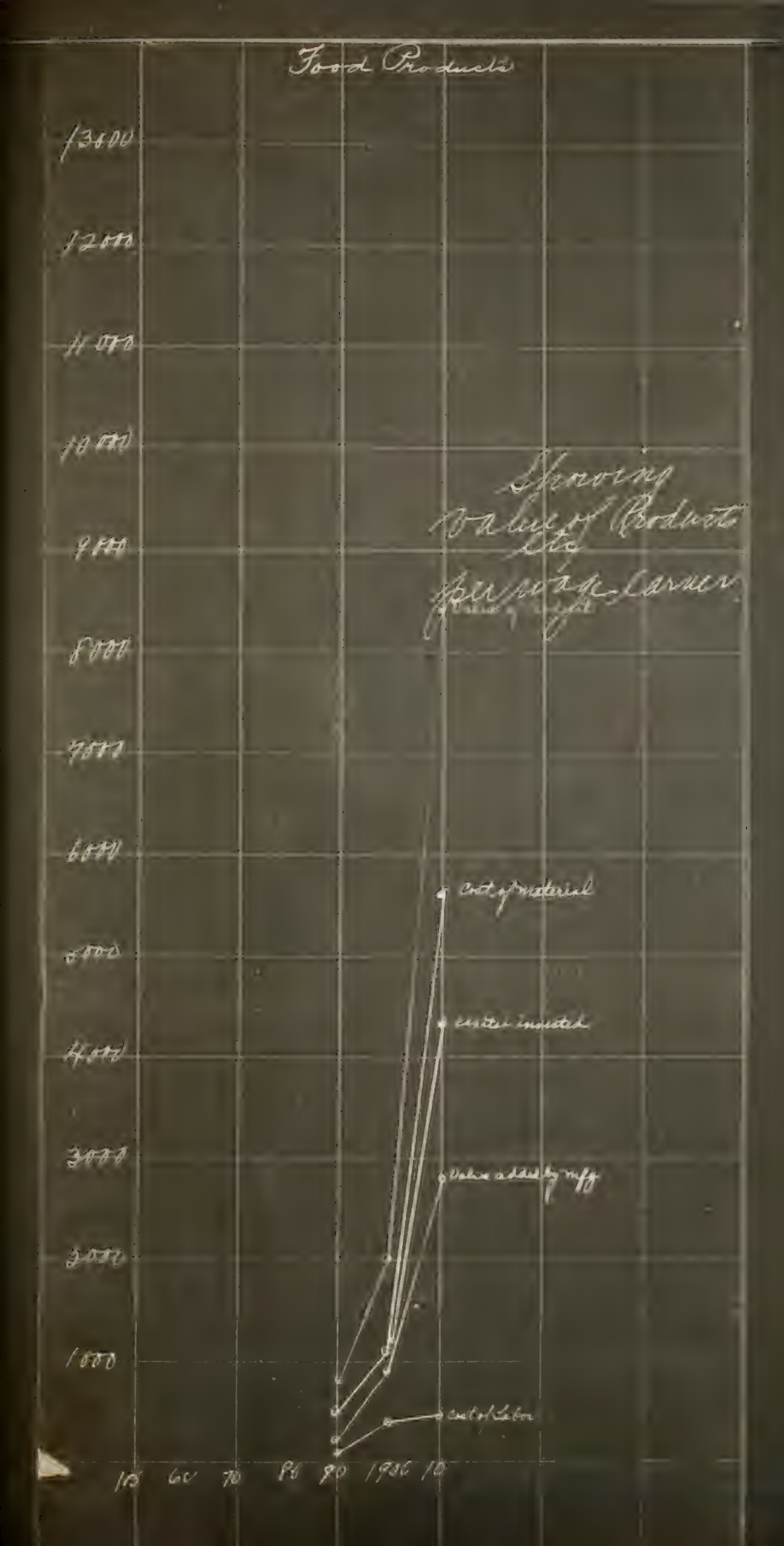

Grease
Showing Value of Products
etc.
Per Wage Earner
Value of Products
Capital Invested
Cost of Material
Value added by Mfg.
Cost of Labor


Slaughtering and Meat Packing
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
Cost of material
Showing Value of Products,
&c &c,
By Wage Earner.


Soap and Candles
Showing Value of Products, etc, Per Wage Earner
Value of Product
Value added by Mfg.
Cost of Labor
YEARS DRAWN

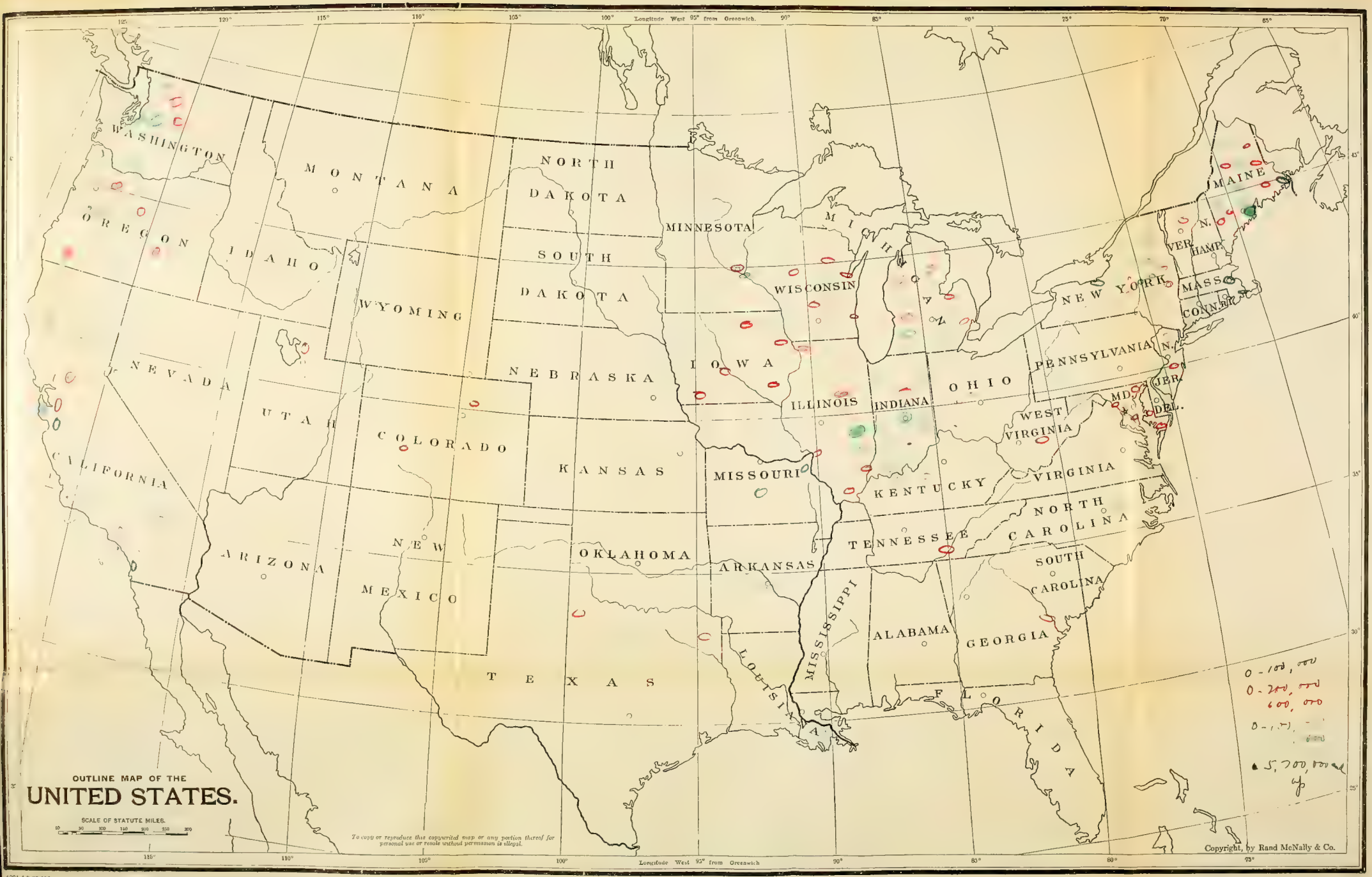

Dairy Products
Showing Value of Product to etc per Wage Earners
Capital invested
Value added by mfg
Cost of labor

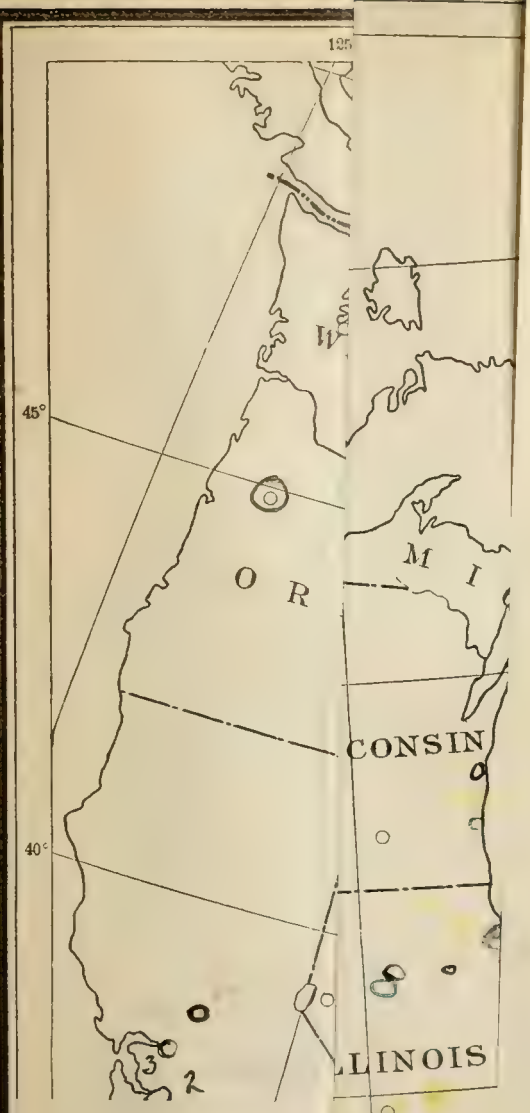

Leather Products
Showing Value of Product
etc.
Per Wage Earner
Value of Product
Cost of Material
Capital Invested
Value added by mfg
Cost of labor


Food Products
$3600
$2000
$1400
$1000
$800
$600
$400
$300
$200
$100
Showing
Value of Products
Etc
per wage earner
Cost of material
Cost of labor
Value added by mfg
10
60
70
80
90
1900
10

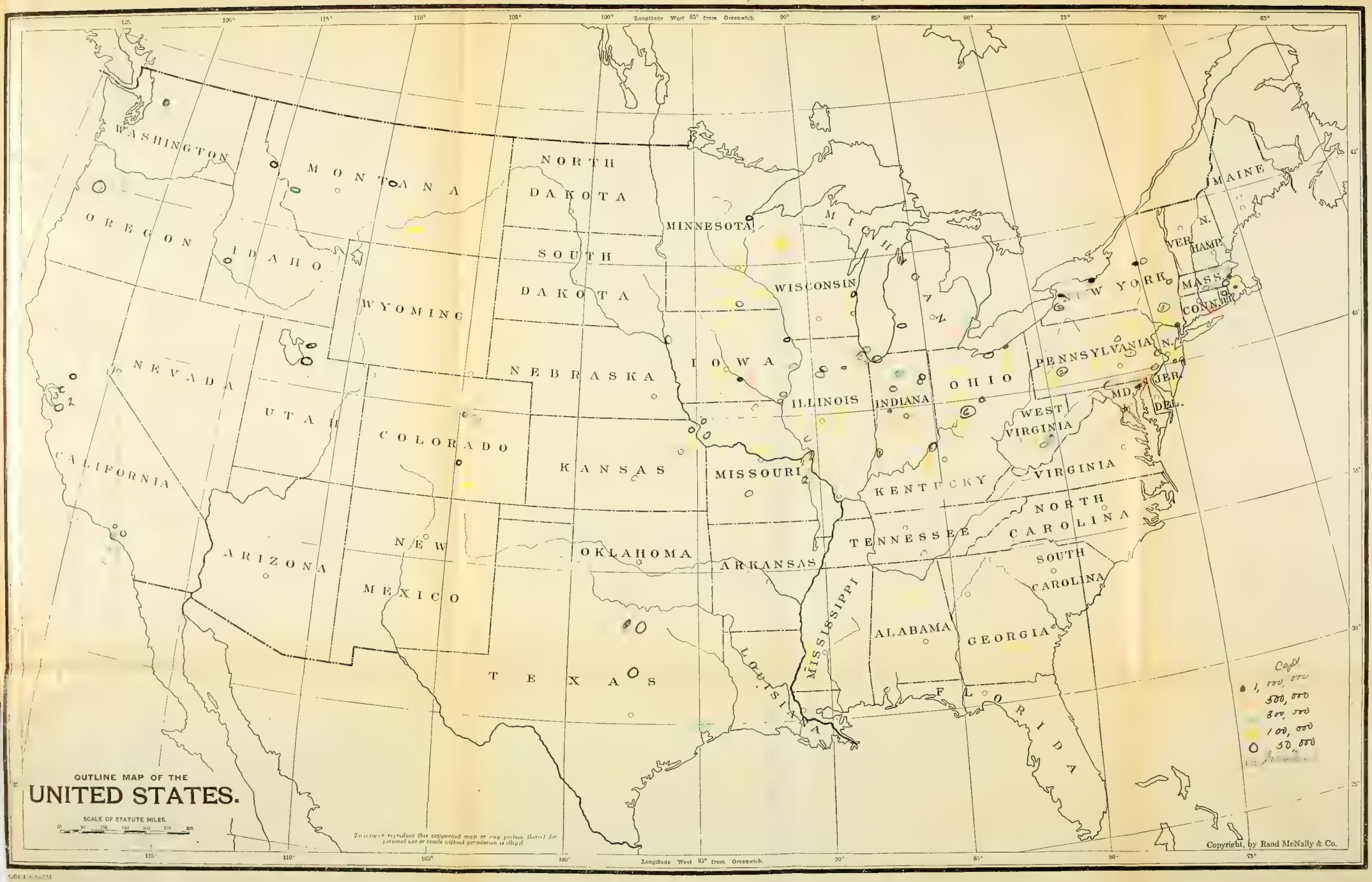
45°
40°
CONSIN
LLINOIS

Centers of Pork Packing Industry and Capital Invested in Each




45°
40°
O R
M I
CONSIN
LLINOIS
3
2

Centers of Slaughtering & Meat Packing Industry & Capitals Denoted



APPENDIX F

FORMS IN USE

by the

PACKARD MOTOR CAR COMPANY

with

Changes Suggested Where Necessary

to Provide for the Employment

of the Handicapped

APPENDIX 3

NOTES IN USE

of one

ADVANCED BLOCK OTE COURSE.

with.

Theorem Demonstrate Where necessary.

to locate the Application

of the Hundredweight

APPENDIX F

SURVEY OF THE PACKARD MOTOR CAR COMPANY

The motor industry differs from almost every other in-d dustry in the country in that the shop methods that are followed are in advance of almost every other type of machine work. The use of automatic machinery and the development of specialization has been carried to the limit in this industry. Not all of the improvements of any one kind will be found in a single plant, but when a good idea is found in any other industry, the chances are that some company in the automobile industry is making use of the idea.

The industry is also peculiar in that the work involved covers a wide range of trades. Nearly every trade involved in metal or wood working is represented. Due to the production of various grades of cars, the possibilities of machine and organization development have been tremendous. Perhaps the best laid out plant of any kind whatever in the United States is the Ford Motor Company's plant of Detroit. Wherever quantity production exists, the principles laid down by the Ford Motor Company are more or less applicable, and are coming more and more into general use. On the other hand, perhaps one of the best organized machine shops in the world for specialized production is the Franklin Motor Company, of Syracuse, New York. The motor industry, very naturally confines itself to large industrial centers because of the large amount of skilled labor that is required.

The work done for the blind in this industry will apply to the larger cities only, but once the application has been worked, the high degree of specialization and the progressive policies pursued by the heads of the motor industry will very probably take care of practically all of the blind in the cities where the motor industry exists.

In practically every motor plant of the country is found an employment department. The forms that are used differ somewhat.

The Packard Motor Car Company of Detroit, Michigan, represents one of the firms manufacturing a high grade of special cars in fairly large quantities. The employment department is fairly well organized and keeps a very good index of its personnel. In going over the employment system, it was found that all that was required to properly index the employment requirements was to place the requirements on the card forms that already existed.

APPENDIX E

SURVEY OF THE PACKARD MOTOR CAR COMPANY

The motor industry differs from almost every other industry in the country in that the shop methods that are followed are in advance of almost every other type of machine work. The use of automatic machinery and the development of specialization has been carried to the limit in this industry. Not all of the improvements of any one kind will be found in a single plant, but when a good idea is found in any other industry, the chances are that some company in the automobile industry is making use of the idea.

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The work done for the plant in this industry will apply to the larger cities only, but once the application has been worked, the high degree of specialization and the progressive policies pursued by the heads of the motor industry will very probably take care of practically all of the plant in the cities where the motor industry exists.

In practically every motor plant of the country is found an employment department. The forms that are used differ somewhat.

The Packard Motor Car Company of Detroit, Michigan, [illegible] one of the first manufacturing a high grade of special cars in fairly large quantities. The employment department is fully well organized and keeps a very good index of its personnel. In going over the employment system, it was found that all that was required to properly index the employment requirements was to place the requirements on the card forms that already existed.

Following is a list of the various forms used, and the changes that will be required on each in order to properly index the work of the survey:

"Suspended Roll Record"

card in this space.

SUGGESTION

Provide space in which to state applicant's physical qualifications and the requirements of the job.

"Suspended Roll Record"

card in this space.

Provide space in which to state applicant's physical qualifications and the requirements of the job.

Following is a list of the various terms used, and the changes that will be required on cards in order to properly insert the word in the array:

"Introduction Card"

in this space

SUGGESTION

Provide space for requirements of the job on the first line; then the qualifications of the applicant.

"Help Requisition"

card in this space

SUGGESTION

Provide space for requirements of job to be filled.

"Introduction Card"

in this space

SUGGESTION

Provide space for requirements of the job on the first line; then the qualifications of the applicant.

"Help Requisition"

card in this space

SUGGESTION

Provide space for requirements of job to be filled.

"Application for Transfer"

in this space

SUGGESTION

Provide space for qualifications of applicant himself.

"Employees Departmental Record"

in this apaee

SUGGESTION

Provide space for the applicant's physical qualifications and the requirements of the old job and the new job.

"Application for Transfer"

in this space

SUGGESTION

Provide space for qualifications of applicant himself.

"Employee Department Notice"

in this space

DIRECTION

Provide space for the applicant's special qualifications and
the requirements of the old job and the new job.

SUGGESTION

Include the policy of the company concerning the employment of handicapped people, in the employees' Rules and Regulations.

"Packard Rules and Regulations" in this apace

Include the policy
of the company concerning
the employment of handicapped
people, in the employees'
Rules and Regulations.

Insert
Rules and Regulations"
in this space

SUGGESTION

Publish a summary of the Survey, in the Foremen's Duties.

"Packard
Duties of a Foreman"

in this space.

Publish a summary
of the Survey, in the

in this space.

"Application Card"

in this space

SUGGESTION

Provide space on the application card for the applicant's physical qualifications, which are obtained by the examining Doctor.

"Application Card"

in this space

SUGGESTION

Provide space on the application card for the applicant's physical qualifications, which are obtained by the examining doctor.

Employment Record Card

in this space

SUGGESTION

Provide space on the employment record card for the applicant's physical qualifications, which are obtained by the examining Doctor.

Employment Record Card

in this space

"Physical Examination"

in this space.

Qualifications Date

Name

Description

No. 56 Number of Men

Design for this form was arranged for a card file to enable the employment man to have an easy reference to the various jobs.

Name

Description

No. 25 Number of Men

Design for this form was arranged for a card file to enable the employment man to have an easy reference to the various jobs.

Form 2, Rand Card File.

Training	Arms	Nerves	Hands	Ears	Fingers	Condition of fingers	Trunk organs	Heart	Kidneys and bowels	Legs	Rupture	Size of man	Lungs	Skin	Vision	RATE .80 ES .002

Operating and oiling overhead traveling crane for handling material in yard or hammer room.

Crane operator--Traveling No. on job 2

This form was designed to enable the man working on job analysis to work out a Rand Card Form which would enable him to put down the full description of his job analysis and to read the requirements and the description along with other details at a glance. Note that the name of the job is at the bottom on the edge where the Rand Card shows in automatic index.

Crane operator--Traveling No. on job 2

Operating and oiling overhead traveling crane for handling material in yard or hammer room.

| | | |

Rand Card

Description

Qualifications

Rate

Name

Number

A second card designed for the Rand File which can be used alternately with Form 2

A second card designed for the Hand File which can be used alternately with Form 2

Name	Department and Operation Number
Description	
Qualifications	Rate

Another card designed for a card file

Another card designed for a card file

Name	Department and Order Number
Qualifications	Rate
Description	

Card designed for card file

Form 5A

Example of Form 5 filled out

APPENDIX G

ORGANIZATION CHARTS

OF THE

FORGE AND FOUNDRY

DIVISIONS

of the

PACKARD MOTOR CAR COMPANY

DETROIT-MICHIGAN

APPENDIX G

A study of the plant of the Packard Motor Car Company shhws that there are two main sections:

1. Forge and foundry division, and

2. All other divisions.

The labor conditions in the forge and foundry are harder to meet than in any other part of the shop, largely because of the difficult character of the work involved and because of the strenuous labor. In carrying on this study, it was decided that in order to test the matter out, a study should be made of the forge and foundry so as to have the results on the two most difficult departments. In these two departments the work does not go through one machine or any one set of machines in succession. There is not sufficient work of any one type to keep any one machine going its full time. Hence, it is necessary to use the organization chart, rather than the procedure chart, as a method of showing the requirements of the job. The charts herewith will show the organization with the employment requirements of each position of the forge and foundry divisions of the Packard Motor Car Company.

The following is a table showing the physical requirements of these two departments in terms of possible handicaps:

The Number of Employees Handicapped in the Respects Noted Who Can be Used in the Two Important Divisions of the Plant of the

PACKARD MOTOR CAR COMPANY

Nature of Handicap	Forge Division	Foundry Division
ARMS	1	4
NERVES	30	48
HANDS	7	6
EARS	9	49
Fingers	20	20

APPENDIX B

A study of the plant of the Packard Motor Car Company shows that there are two main sections:

1. Forge and foundry division, and

2. All other divisions.

The labor conditions in the forge and foundry are harder to meet than in any other part of the shop, largely because of the difficult character of the work involved and because of the strenuous labor. In carrying on this study, it was decided what in order to test the matter out, a study should be made of the forge and foundry so as to have the results on the two most difficult departments. In these two departments the work does not go through one machine or any one set of machines in succession. There is not sufficient work of any one type to keep any one machine going its full time. Hence, it is necessary to use the organization chart, rather than the procedure chart, as a method of showing the requirements of the job. The charts herewith will show the organization with the employment requirements of each position of the forge and foundry divisions of the Packard Motor Car Company.

The following is a table showing the physical requirements of these two departments in terms of possible handicaps:

The Number of Employees Handicapped in the Respects Noted Who Can be Used in the Two Important Divisions of the Plant of the

PACKARD MOTOR CAR COMPANY

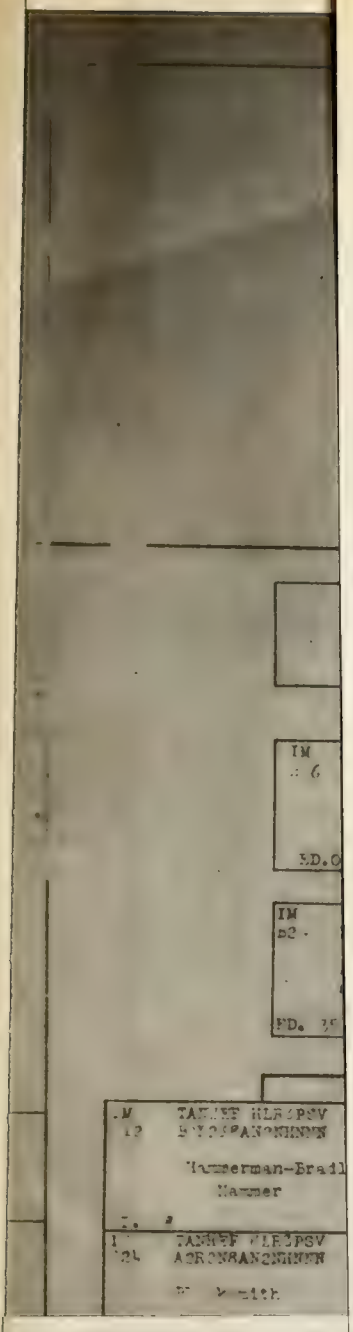
		4
		41
		1
		41
		46

TRUNK ORGANS	24	43
LEGS	8	32
RUPTURE	9	24
LUNGS	4	26
SKIN	14	12
VISION	15	42
BLIND		1

The general value of the work at the Packard Motor Car Company is that if the blind and handicapped can be employed in the two most difficult departments of one of the most highly specialized shops of the motor industry, the possibilities in other motor companies are very much greater. It will be seen that the motor industry offers a great field for the employment of the blind.

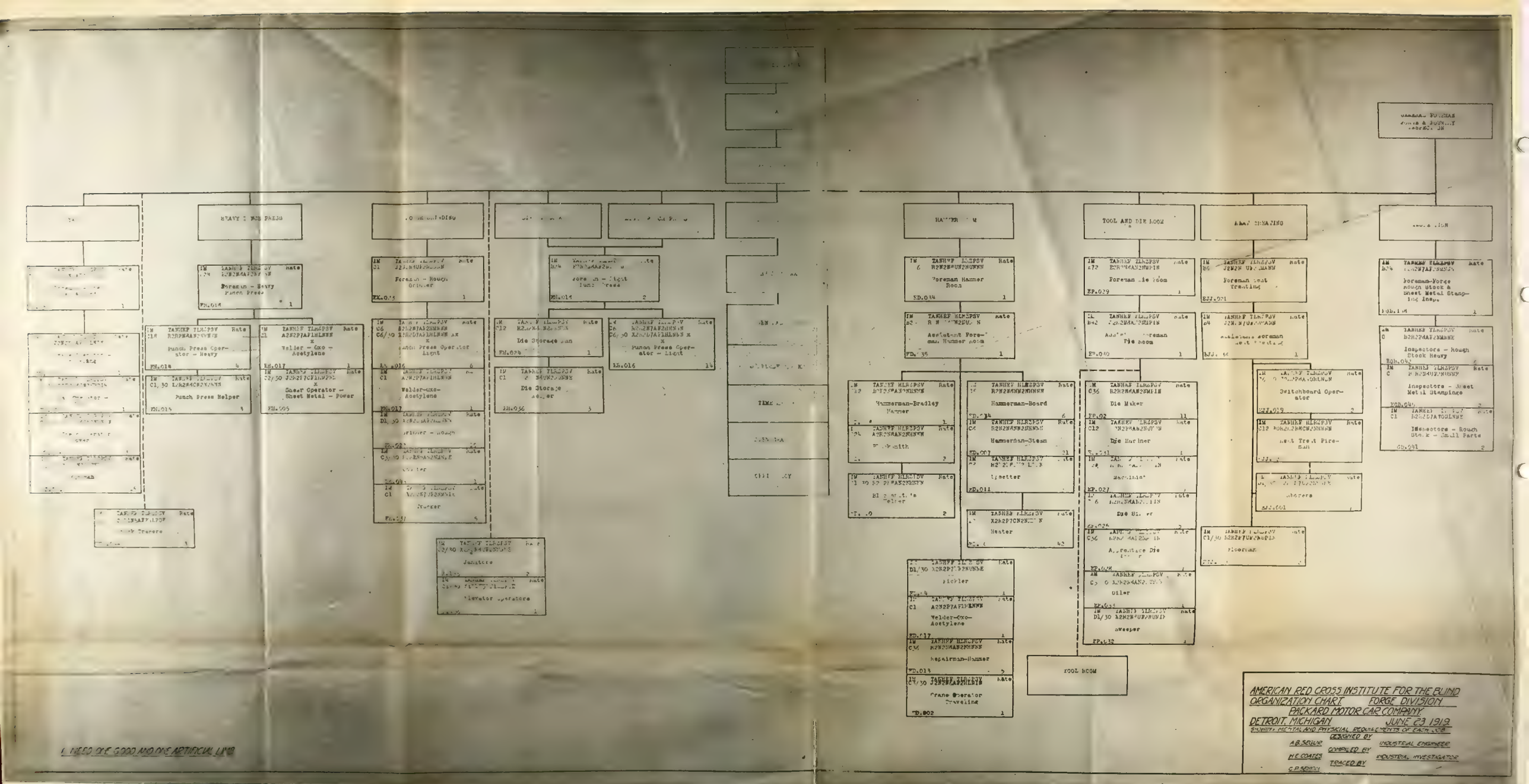
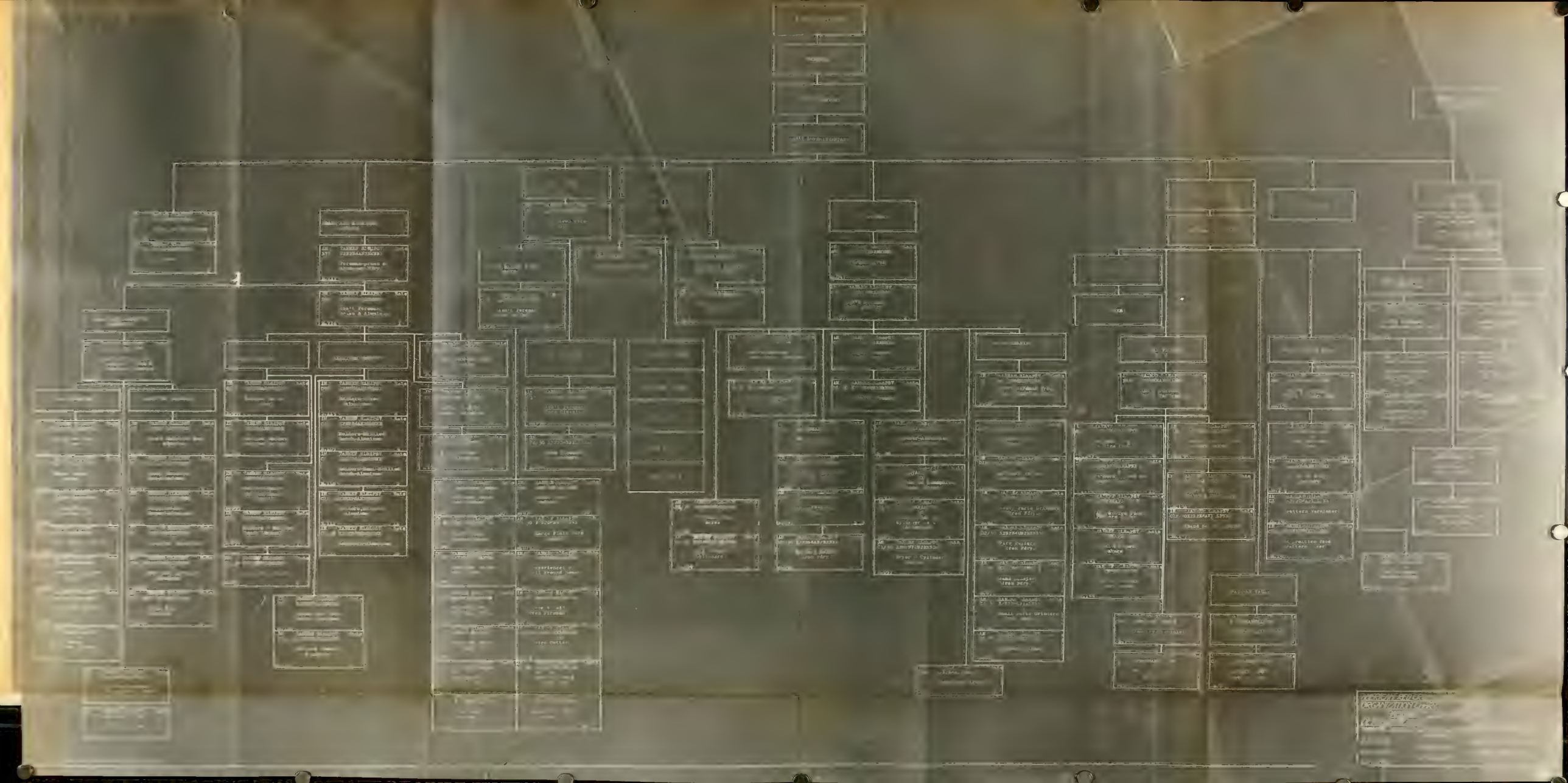
BLIND		1
VISION	15	45
HEAR	14	14
LIMBS	4	29
MULTIPLE	2	24
LUNGS	2	24
[illegible]	24	45

The general value of the work of the Training Center for Handicapped is that if the blind and handicapped can be employed in the two major artificial departments of one of the most highly specialized shops of the motor industry, the possibilities in other motor industry offers a great field for the employment of the blind. equipment are very much greater. It will be seen that the motor


IM
.: 6
IM
Hammerman-Brail
Hammer

TRUNK ORGANS	24	45
[illegible]	6	32
RUPTURE	2	24
LUNGS	4	26
SKIN	14	41
VISION	15	42
BLIND		1

The general value of the work at the Packard Motor Car Company is that if the blind and handicapped can be employed in the two most difficult departments of one of the most highly specialized shops of the motor industry, the possibilities in other motor companies are very much greater. It will be seen that the motor industry offers a great field for the employment of the blind.


HEAVY DROP FORGE
Foreman – Heavy Drop Forge
Punch Press Operator – Heavy
Punch Press Helper
Welder – Oxo – Acetylene
Chaser Operator – Sheet Metal – Power
Trucker
Janitors
Elevator Operators
Foreman – Light Drop Forge
Punch Press Operator – Light
Die Storage Man
Die Storage Helper
HAMMER ROOM
Foreman Hammer Room
Assistant Foreman Hammer Room
Hammerman-Bradley Hammer
Hammerman-Board
Hammerman-Steam
Heater
Pickler
Welder-Oxo-Acetylene
Repairman-Hammer
Crane Operator Traveling
TOOL AND DIE ROOM
Foreman Die Room
Assistant Foreman Die Room
Die Maker
Die Mariner
Machinist
Die Sinker
Automatic Die Sinker
Oiler
Sweeper
TOOL ROOM
HEAT TREATING
Foreman Heat Treating
Assistant Foreman Heat Treating
Switchboard Operator
Heat Treat Fireman
Laborers
Floorman
INSPECTION
Foreman-Forge Rough Stock & Sheet Metal Stamping Insp.
Inspectors – Rough Stock Heavy
Inspectors – Sheet Metal Stampings
Inspectors – Rough Stock – Small Parts
AMERICAN RED CROSS INSTITUTE FOR THE BLIND
ORGANIZATION CHART FORGE DIVISION
PACKARD MOTOR CAR COMPANY
DETROIT, MICHIGAN JUNE 23 1919
SHOWING MENTAL AND PHYSICAL REQUIREMENTS OF EACH JOB
DESIGNED BY A.B. SELLIS INDUSTRIAL ENGINEER
COMPILED BY M.E. COATES INDUSTRIAL INVESTIGATOR
TRACED BY C.P. SMITH
1 DEAF OR 1 DEAF AND ONE ARTIFICIAL LIMB